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OFFICE OF  
CHEMICAL SAFETY AND  
POLLUTION PREVENTION

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**MEMORANDUM**

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**Subject:** **Fipronil:** Drinking Water Assessment in Support of Registration Review

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The Environmental Fate and Effects Division (EFED) has completed the drinking water assessment (DWA) for a phenylpyrazole insecticide, fipronil [5-amino-1-(2,6-dichloro- $\alpha,\alpha,\alpha$ -trifluoro-p-tolyl)-4-trifluoromethylsulfenylpyrazole-3-carbonitrile], in support of human health risk assessments performed by the Health Effects Division (HED) for the fipronil registration review. Fipronil has a single agricultural use (in furrow potato seed piece treatment) and several non-agricultural uses including pet uses, termiticide uses, and insect control uses in lawns and turf, landscapes, and pine seedling nurseries. It is applied in ready-to-use formulations for pet uses, liquid formulations for ground spray or termiticide applications, or granular formulations. Because of previous regulatory actions taken out of concern for aquatic risk concerns (affected through label changes), the remaining fipronil uses are those that will result in limited transport to aquatic ecosystems or result in high public health benefits (invasive ant control).

There are four major reasons why the estimated drinking water concentrations (EDWCs) for the fipronil residues of concern (ROCs) differ from the previous DWA:

1. Several fipronil uses have been cancelled including the use (a proposed onion seed treatment that was never registered) on which the previous EDWC recommendations were based (USEPA 2006; DP 322415).
2. A new wider building perimeter use was added to control tawny crazy ants in areas where this invasive species has colonized. (This new use produces the highest surface water EDWCs.)
3. The groundwater model used in this assessment (PRZM-GW as incorporated into the PWC v.152) has replaced the older groundwater model used in the previous DWA.
4. The formation and decline (FD) approach is used to model both the parent compound and three major metabolites, fipronil sulfide (MB 45950), fipronil sulfone (MB 46136), and fipronil desulfinyl (MB 46513) to account for additional degradate fate studies provided by the registrants (hereafter, these degradates are referred to as “sulfide”, “sulfone” and “desulfinyl”). In theory, the FD approach should produce more representative EDWCs than the approach used in the previous DWA (see Section 3.2 and Appendix 4 for details).

Based upon this assessment, EFED recommends the following EDWCs of **14.5 µg/L** for the 1-in-10 year daily peak EDWC (acute) and **13.5 µg/L** for the 1-in-10 year chronic and cancer EDWC for fipronil. For sulfide, EFED recommends **0.254 µg/L** (acute), **0.00799 µg/L** (chronic), and **0.00604 µg/L** (cancer) EDWCs. For desulfinyl, EFED recommends **0.108 µg/L** (acute), **0.0682 µg/L** (chronic), and **0.0531 µg/L** (cancer) EDWCs. The recommendations for fipronil, sulfide and desulfinyl are all based on EFED modeling. For sulfone, EFED recommends either:

- **0.536 µg/L** (acute), **0.135 µg/L** (chronic), and **0.107 µg/L** (cancer) EDWCs based on EFED modeling; or
- **4.6 µg/L** (acute), **3.2 µg/L** (chronic), and **3.2 µg/L** (cancer) EDWCs based on NAWQA monitoring data.

Note that the modeled EDWCs are based on degradation rates that account for the potential for unextracted residues to be degradates of concern (*i.e.*, these EDWCs are “conservatively” calculated in the sense that they are more protective of human health). However, excluding unextracted residues would produce only limited reductions in the EDWCs (*e.g.*, the acute fipronil EDWC would change from 14.5 to 13.8 µg/L). The modeled recommendations are summarized in **Table 1**.

**Table 1. Estimated Drinking Water Concentrations (EDWCs) of Fipronil Residues of Concern (ROC) from Surface Water and Groundwater Sources <sup>A</sup>**

| Source   | Use Site<br>(Max. Annual App. Rate)  | Parent/<br>Degradate | Acute<br>EDWC<br>(µg/L) | Chronic<br>EDWC<br>(µg/L) | Cancer<br>EDWC<br>(µg/L) |
|--|--|----------------------|-------------------------|---------------------------|--------------------------|
| Pesticide<br>Water<br>Calculator<br>(PWC ver.<br>1.52) | <b>Surface water</b> – Building perimeter 3’ up<br>and 10’ out (tawny crazy ant) ground spray<br>@ 0.3267 lb ai/A*, 2 apps with a 6 month<br>interval. | Fipronil             | 1.13                    | 0.134                     | 0.0949                   |
|  |  | Sulfide              | 0.0183                  | <b>0.00799</b>            | <b>0.00604</b>           |
|  |  | Sulfone              | 0.205                   | <b>0.135</b>              | <b>0.107</b>             |
|  |  | Desulfinyl           | <b>0.108</b>            | <b>0.0682</b>             | <b>0.0531</b>            |
|  | <b>Groundwater</b> – Wisconsin Corn<br>(Met File 14920.dvf)  | Fipronil             | <b>14.5</b>             | <b>13.5</b>               |                          |
|  |  | Sulfide              | 0.0675                  | NA <sup>1</sup>           |                          |
|  |  | Sulfone              | 0.100                   | NA <sup>1</sup>           |                          |
|  |  | Desulfinyl           | NA <sup>2</sup>         | NA <sup>2</sup>           |                          |
|  | <b>Groundwater</b> – Florida Citrus<br>(Met File 12842.dvf)  | Fipronil             | 7.78                    | 7.18                      |                          |
|  |  | Sulfide              | <b>0.254</b>            | NA <sup>1</sup>           |                          |
|  |  | Sulfone              | <b>0.536</b>            | NA <sup>1</sup>           |                          |
|  |  | Desulfinyl           | NA <sup>2</sup>         | NA <sup>2</sup>           |                          |

\* Application rate indicated refers to the application rate within the treated building perimeter area.

<sup>A</sup> EFED recommends the maximum EDWC values in bold

<sup>1</sup> These degradates did not ‘breakthrough’ within 100 years of simulation, therefore no post-breakthrough average could be calculated for the chronic groundwater EDWC.

<sup>2</sup> The desulfinyl degradate is produced through photolytic reactions that do not occur in EFED’s groundwater modeling scenario.

The modeled surface water EDWCs are generally supported by the non-targeted U.S. Geological Survey’s (USGS) National Water Quality Assessment (NAWQA) program’s surface water monitoring data with both the acute and chronic EDWCs being comparable to the maximum and 95<sup>th</sup> percentile values from monitoring. The maximum values from NAWQA surface water monitoring are 6.41, 0.507, 203, and 1.54 µg/L for fipronil, sulfide, sulfone, and desulfinyl, whereas the 95<sup>th</sup> percentile surface water monitoring values are 0.04, 0.013, <4, and 0.012 µg/L, respectively. Note that both the acute and chronic surface water EDWCs fall between the maximum and 95<sup>th</sup> percentile monitoring values for fipronil and desulfinyl, whereas only the acute does for sulfide with the chronic and cancer EDWCs falling slightly below the 95<sup>th</sup> percentile value. Such comparisons are made difficult for fipronil sulfone because many of the USGS samples have a relatively high detection limit of 3.5 µg/L or greater relative to other fipronil sulfone samples which have detection limits as low as 0.0013 µg/L.

Nonetheless, the NAWQA data set (summarized in **Appendix 5**) contains many samples with fipronil sulfone concentrations that inexplicably, are an order of magnitude or more higher than would be expected from the current pesticidal use scenarios considered here and/or historical uses. The highest sulfone value of 203 µg/L seems questionable since it occurs at a site in Idaho at which 118 of 119 samples did not detect sulfone (possibly this sample is a mislabeled spiked sample). Many of the other high sulfone values are from small watersheds (<1000 mi<sup>2</sup>) whose values would not be representative of a drinking source water. However, 88.5% of the 26 samples from the North Canadian River near Harrah, Oklahoma (Station ID 7241550; watershed drainage area of 13,775 mi<sup>2</sup>) detected sulfone with a peak concentration of 4.6 µg/L and an average concentration of 3.2 µg/L calculated as the average of the detected concentrations (non-detects not included; all detection limits of non-detects ≥4 µg/L). If the Health Effects Division wants to use the higher monitored values in its risk assessment, EFED would recommend these North Canadian River values. These EDWC recommendations supersede all previous recommendations (USEPA 2006; DP 322415).

## **Previous Drinking Water Assessment**

A drinking water exposure assessment was conducted in 2006 in support of human health risk assessment (USEPA 2006; DP 322415), which was subsequently revised in 2007 (under the same DP Barcode 322415) for the parent fipronil and the individual degradation products, fipronil sulfide (MB45950), fipronil sulfone (MB 46136) and fipronil desulfinyl (MB 46513). PRZM (3.12 beta) and EXAMS (2.97.5) using PE4V01.pl (August 13, 2003) were used to estimate fipronil residue concentrations in drinking water. From the registered and proposed uses for fipronil, the highest concentrations of fipronil and its degradation products in surface source drinking water were expected to be from the proposed use on onion seeds (0.1 lbs ai/A). In this previous DWA, source water concentrations in surface were not expected to exceed: 2.7 µg/L (acute) and 0.16 µg/L (chronic) for fipronil; 0.086 µg/L (acute) and 0.031 µg/L (chronic) for fipronil sulfide; 0.39 µg/L (acute) and 0.14 µg/L (chronic) for fipronil sulfone; and 0.027 µg/L (acute) and 0.0063 µg/L (chronic) for fipronil desulfinyl. However, the onion seed treatment was not registered.

Ground water concentrations for fipronil and its degradation products were estimated using SC2.3 (July 29, 2003). (SC2.3 is a version of the SCIGROW model which is no longer used by the Agency for groundwater modeling.) The proposed use on in-furrow corn and rutabagas/turnip uses had the highest predicted concentrations (0.021 µg/L for fipronil, 0.000796 µg/L for MB136, 0.000386 µg/L for MB513, and 0.000187 µg/L for MB950) in ground water. These uses are no longer registered for fipronil.

## **Mode of Action**

Fipronil affects the gamma-aminobutyric acid neurotransmission system by interfering with the passage of chloride. In addition, research data indicate that fipronil displays a higher potency in the insect GABA chloride channel than in the vertebrate GABA chloride channel, which may indicate selective toxicity (Hainzl and Casida, 1996).

### **1. Use Characterization**

Fipronil has only a single agricultural use, but many non-agricultural uses. An in-furrow spray application of fipronil over potato pieces as they are planted is the only agricultural use of fipronil that is allowed in the United States. According to a screening level usage analysis (SLUA) of national agricultural pesticide usage data (2004 – 2013) by the Agency's Biological and Economic Analysis Division (BEAD), an annual average of 6000 lbs ai fipronil was applied to agricultural sites in the United States (USEPA 2015). (While corn seed treatment is allowed on U.S. labels, this use is for export only and cannot be planted in the United States.)

There are many non-agricultural uses of fipronil. These fall into three categories: pet uses, termiticide uses, and insect control uses in lawns and turf, landscapes, and pine seedling nurseries. Pet uses refers to ready-to-use formulations that are applied directly to animals (dogs and cats) to control fleas and ticks. Such applications are considered unlikely to result in

appreciable exposure to humans through surface or groundwater drinking water<sup>1</sup> and therefore, will not be considered further in this drinking water assessment (DWA).

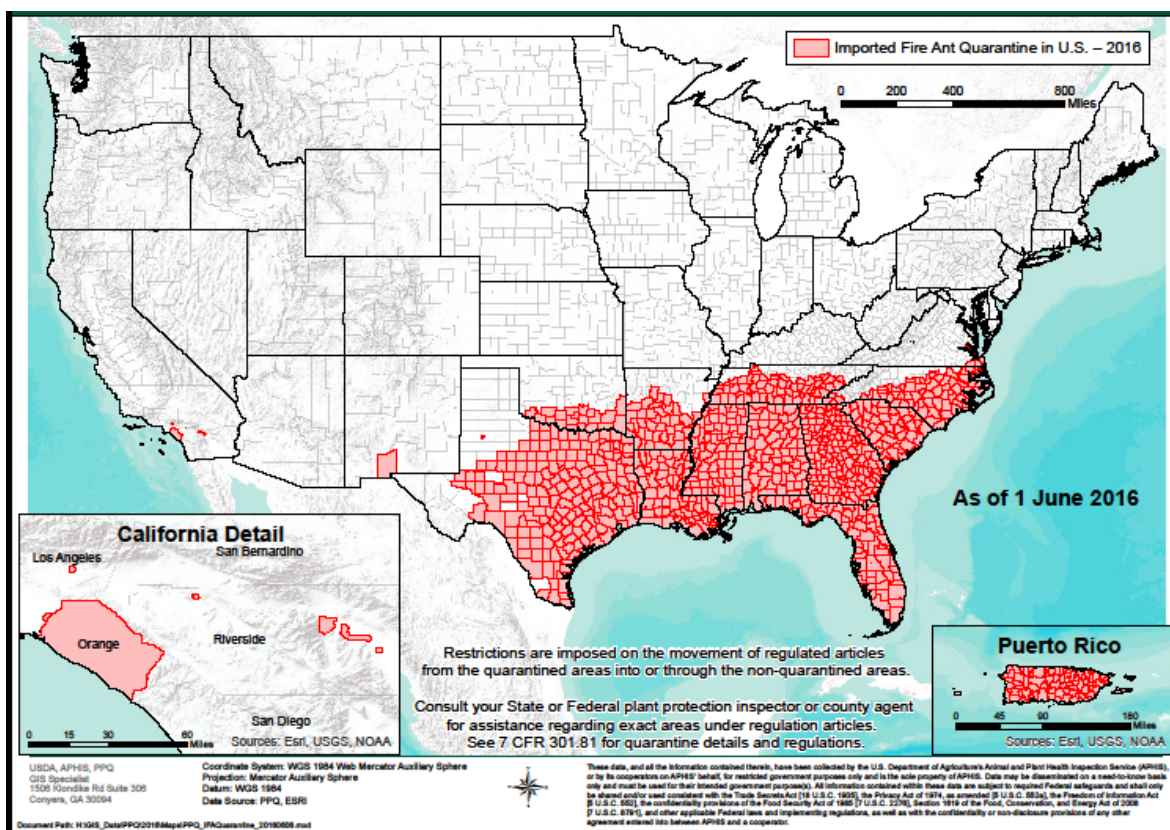
Similarly, termiticide uses are not further considered in this DWA, but the reasoning varies with drinking water source. For surface water sources of drinking water, termiticide applications are applied below ground (below concrete slab floors or adjacent to foundation/basement walls) and therefore are unlikely to be transported to surface waters. For groundwater sources of drinking water, fipronil labels contain setback provisions that do not allow application within a specific horizontal distance of a drinking water well, which is thought to limit exposure.

EPA has been able to obtain only limited usage data for non-agricultural uses. The California Department of Pesticide Regulation (CDPR) Pesticide Use Repotting (PUR) system indicated four categories of use between 2011 and 2013 (USEPA 2016). The average annual fipronil use as summarized from the CDPR PUR data is estimated as 93, 160, 3, and 62,300 lbs ai/year for landscape maintenance, regulatory pest control, rights-of-way maintenance, and structural pest control. The numerically dominant structural pest control category would include both the termiticide uses not considered in this DWA and building perimeter treatments which are assessed in this DWA.

Building perimeter application rates vary geographically with higher rates allowed within the fire ant quarantine area (counties out-lined in red) in Figure 1 for use on imported fire ants or tawny crazy ants (a much smaller, but expanding subset of these counties in Texas and Louisiana).

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<sup>1</sup> Fipronil is used almost exclusively in pet spot-on treatments for which pet bathing is unlikely soon after application. Therefore, the Agency does not assess down-the-drain uses for pet spot-on uses, but does assess for pet shampoos. However, there is one pet use for fipronil that is a spray-on treatment. The Agency assumes this use is more similar to the spot-on treatments in that it is designed to keep the fipronil on the pet for the duration of the time between the monthly treatments.



**Figure 1. Fire Ant Quarantine Area (Counties Out-lined in Red)**

([https://www.aphis.usda.gov/plant\\_health/plant\\_pest\\_info/fireants/downloads/fireant.pdf](https://www.aphis.usda.gov/plant_health/plant_pest_info/fireants/downloads/fireant.pdf); accessed 8/8/16).

Another landscape use of fipronil is a proposed new use that is being assessed at the same time as the registration review of fipronil. It is a wasp bait use of fipronil and is applied within bait stations. Since only minimal amounts of fipronil is proposed for use with bait stations, this proposed use is not expected to result in appreciable exposure to drinking water and is therefore not further considered in this DWA. This proposed use may be further evaluated for ecological risks in the registration review preliminary risk assessment.

The application rates of fipronil for various uses were summarized by the registrants and confirmed by BEAD (Table 2). Application information for some registered uses are not specified (NS) in the tables, such as the maximum number of applications per year and the minimum retreatment intervals. To the extent that any use exceeds the assumptions made in this DWA for uses with unclear label directions, the DWA may under-predict exposure. Use patterns on labels with incomplete application information should be clarified during the Registration Review process to be consistent with the labels with complete application information or further exposure assessment may be needed.

**Table 2. Summary of Application Rates for Registered Uses of Fipronil**

| Uses  | Application Method <sup>1</sup>          | Maximum rate / single application (lbs a.i./A) | Maximum Number of applications / year or Crop Cycle (Assumption) | Maximum Annual (Seasonal) Rate (lbs ai/A) | Minimum Retreatment Interval (days) |
|---|--|--|--|---|-------------------------------------|
| <i>Agricultural Use Sites</i>   |  |  |  |   |                                     |
| Potato  | In-furrow                                | 0.1  | NS (1)   | 0.1                                       | NA                                  |
| <i>Non-Agricultural Use Sites</i>   |  |  |  |   |                                     |
| Slit-placement for mole cricket control   | Granular – slit application              | 0.025  | 2  | 0.050                                     | NS (21)                             |
| Turfgrass and landscape beds, sod farms – fire ant quarantine states only (High application rate) | Granular - Broadcast                     | 0.0125   | 2  | 0.0250                                    | NS (21)                             |
| Turfgrass, golf courses, sod farms – outside fire ant quarantine states (Low application rate)    | Broadcast or Mound treatment             | 0.0000225                                      | 4  | 0.00009                                   | 21                                  |
| Pine seedlings  | Soil injection into ant colony or mounds | 0.1314   | 1  | 0.1314                                    | NA                                  |
| Building perimeter 1' up and 1' out   | Ground spray                             | 0.3267*  | 2  | 0.6534*                                   | NS (21)                             |
| Building perimeter 2' up and 2' out   | Ground spray                             | 0.1838*  | 2  | 0.3676*                                   | NS (21)                             |
| Building perimeter 3' up and 10' out (Tawny crazy ant)  | Ground spray                             | 0.3267*  | 2  | 0.6534*                                   | 60                                  |

NS – not specified. A label clarification for the minimum retreatment interval is needed to reduce this uncertainty. Number in parenthesis is the minimum retreatment interval assumed for modeling purposes in this assessment.

\* Application rate indicated refers to the application rate within the treated building perimeter area.

## 2. Environmental Fate and Transport

Fipronil dissipation appears to be dependent on photodegradation in shallow, clear, well-lit water, microbially mediated degradation, and soil binding. Data indicate that fipronil is relatively persistent and moderately to slightly mobile (FAO classification) in terrestrial environments. In aquatic environments, a determination of the environmental behavior of fipronil is more tentative because soil and aquatic metabolism studies provide contradictory data on fipronil persistence to microbially-mediated degradation processes. Photolysis would be expected to be a major factor in controlling fipronil dissipation in clear, shallow, well-lit aquatic environments, less so in deeper, shaded, and/or turbid waters, and not a factor in groundwater. Fipronil degrades to form persistent and slightly mobile (FAO classification) degradates [sulfide (MB 45950), sulfone (MB 46136), and desulfinyl (MB 46513)]. These degradates are considered in the HED dietary tolerance expression for fipronil (USEPA 1996; 1997).

Unextracted residues occurred in the aerobic soil metabolism (up to 16 %AR), aerobic aquatic metabolism (up to 36 %AR), and anaerobic aquatic metabolism (up to 22 %AR). The solvents used in these studies (acetone, acetonitrile, and methanol) are all polar solvents. Because these unextracted residues exceed 10 %AR and did not include a variety of polar and nonpolar solvents, exposure to fipronil ROCs will be calculated in two ways with a low estimate that does not account for any exposure to unextracted residues and a high exposure that does.

Because fipronil and its degradates have a moderate to high sorption affinity to organic carbon, it is likely sorption on soil organic matter will inhibit to some degree fipronil residue movement into ground and surface waters. However, fipronil residue may have the potential to move in very vulnerable soils (*e.g.*, coarse-textured soils with low organic matter content) and in erodible soils when bound to particles entrained in runoff. Below ground fipronil applications (*e.g.*, in-furrow, termiticide, soil injection, *etc.*) are expected to limit runoff potential.

Registrant-submitted data defining the physical, chemical, fate and transport characteristics associated with the fipronil ROCs are summarized in **Table 3**. Structural representations of fipronil and degradates may be found in **Appendix 1 Table 1**. A more detailed summary of fate data is available in **Appendix 1 Table 2**.

**Table 3. General physico-chemical and environmental fate properties of fipronil and degradates of concern.**

|  | Fipronil  |                                  | Fipronil Sulfide (MB 45950)                        |                                  | Fipronil Sulfone (MB 46136)                       |                 | Fipronil Desulfinyl (MB 46513)                        |                 |
|--|---|----------------------------------|--|----------------------------------|---|-----------------|---|-----------------|
| Parameter  | Value(s)  | Source (MRID)                    | Value(s)   | Source (MRID)                    | Value(s)  | Source (MRID)   | Value(s)  | Source (MRID)   |
| <b>Physico-chemical Parameters</b>                             |   |                                  |  |                                  |   |                 |   |                 |
| Molecular weight   | 437.14 g/mol  | 44262826                         | 421.1 g/mol  | 44262826                         | 453.15 g/mol                                      | 44262826        | 389.09 g/mol  | 44262826        |
| Vapor pressure (at 25°C)                                       | $7.5 \times 10^{-8}$ torr                               | 47723916                         | $1.7 \times 10^{-8}$ torr                          | 44262803                         | $5.7 \times 10^{-9}$ torr                         | 44262802        | $3.0 \times 10^{-8}$ torr                             | 44262801        |
| Water solubility (at 20°C)                                     | 2.3 mg/L  | 47723915                         | 0.09374 mg/L                                       | EpiSuite v4.00                   | 0.16 mg/L   | 44350001        | 0.95 mg/L   | 44350002        |
| Henry's law constant (at 25°C)                                 | $5.2 \times 10^{-13}$ atm-m <sup>3</sup> /mol           | (calculated)                     | $5.02 \times 10^{-14}$ atm-m <sup>3</sup> /mol     | EpiSuite v4.00                   | $2.7 \times 10^{-15}$ atm-m <sup>3</sup> /mol     | (calculated)    | $9.6 \times 10^{-14}$ atm-m <sup>3</sup> /mol         | (calculated)    |
| Octanol-air partition coefficient (K <sub>OA</sub> ) (at 25°C) | 11.5  | EpiSuite v4.00                   | 16.5   | EpiSuite v4.00                   | 18.2  | EpiSuite v4.00  | 14.3  | EpiSuite v4.00  |
| Octanol-to-water partition coefficient (log P <sub>OW</sub> )  | 3.5   | 44350003                         | 4.82   | EpiSuite v4.00                   | 3.8   | 44350004        | 3.4   | 44350005        |
| <b>Persistence</b>   |   |                                  |  |                                  |   |                 |   |                 |
| Hydrolysis half-lives  | 10,322 d pH 5<br>2140 d pH 7<br>28.7 d pH 9             | 42977905 (25°C)                  | 827 pH 4<br>827 d pH 5<br>806 d pH 7<br>234 d pH 9 | 49151509 (25°C)                  | 448 pH 4<br>447 d pH 5<br>416 d pH 7<br>52 d pH 9 | 49151510 (25°C) | 1368 d pH 4<br>1354 d pH 5<br>620 d pH 7<br>11 d pH 9 | 49151511 (25°C) |
| Aqueous photolysis half-life                                   | 0.34 d (Latitude 30°N)                                  | 42918661 (25°C)                  | 0.47 d (Latitude 56°N)                             | 49151512                         | 1.3 d (Latitude 56°N)                             | 49151513        | 3.2 d (Latitude 56°N)                                 | 49151514        |
| Soil photolysis half-life                                      | 34 d  | 42918662                         | No Data  |                                  | No Data   |                 | No Data   |                 |
| Aerobic soil metabolism half-life                              | Manningtree 102 d<br>Speyer 223 d                       | 42918663                         | 214 d<br>59.1 d                                    | 42918663                         | 1487 d<br>105 d                                   | 42918663        | loamy sand I 630 d<br>loamy sand II 693 d             | 44262830        |
| Aerobic aquatic metabolism half-life                           | sandy loam 14.1 d<br>Ongar 20.3 d<br>Manningtree 30.0 d | 44261909<br>44661301<br>44661301 | 7317 d<br>2096 d<br>Stable                         | 44261909<br>44661301<br>44661301 | No Data   |                 | Manningtree 644 d<br>Ongar 706 d                      | 49151518        |

|   | Fipronil   |  | Fipronil Sulfide (MB 45950)                                   |                      | Fipronil Sulfone (MB 46136)                                   |               | Fipronil Desulfinyl (MB 46513)                                |               |
|---|--|--|---|----------------------|---|---------------|---|---------------|
| Parameter   | Value(s)   | Source (MRID)  | Value(s)  | Source (MRID)        | Value(s)  | Source (MRID) | Value(s)  | Source (MRID) |
| Anaerobic aquatic metabolism half-life                              | 117 d (total system)   | 43291704   | Stable<br>Stable  | 43291704<br>49151519 | Stable  | 49151519      | Stable  | 49151519      |
| Soil Mobility   |  |  |   |                      |   |               |   |               |
| Organic carbon-normalized adsorption coefficient (K <sub>OC</sub> ) | 1248 mL/g<br>800 mL/g<br>673 mL/g<br>427 mL/g<br>486 mL/g  | 44039003   | 5621 mL/g<br>3530 mL/g<br>4362 mL/g<br>4349 mL/g<br>1695 mL/g | 44537902             | 5310 mL/g<br>4054 mL/g<br>6745 mL/g<br>1448 mL/g<br>3486 mL/g | 44537901      | 1150 mL/g<br>1498 mL/g<br>1164 mL/g<br>1245 mL/g<br>1392 mL/g | 44262831      |
| Dissipation   |  |  |   |                      |   |               |   |               |
| Terrestrial field dissipation half-life (soil texture or crop)      | 1.1 months (FL bare sand)<br>0.4 months (FL turfed sand)<br>1.5 months (NC bare loamy sand)<br>1.5 months (NC turfed sand)<br><br>3.4 months (loam soil)<br>3.0 months (clay loam)<br>3.8 months (sand)<br>7.3 months (loamy sand)<br><br>159 d (CA cotton)<br>30 d (TX cotton)<br>192 d (WA potato) | 44078601<br><br><br><br><br>43401103<br><br>44262826 | No Data   |                      | No Data   |               | No Data   |               |

|  | Fipronil   |               | Fipronil Sulfide (MB 45950) |               | Fipronil Sulfone (MB 46136) |               | Fipronil Desulfinyl (MB 46513) |               |
|--|--|---------------|-----------------------------|---------------|-----------------------------|---------------|--------------------------------|---------------|
| Parameter  | Value(s)   | Source (MRID) | Value(s)                    | Source (MRID) | Value(s)                    | Source (MRID) | Value(s)                       | Source (MRID) |
| Aquatic field dissipation half-life (soil texture or crop) | Seed Treatment:<br>14.6 d (MS loam)<br>12.6 d (TX sandy loam)<br>11.9 d (CA clay)<br>Soil Pre-plant Incorporated:<br>17.4 d (MS loam)<br>18.8 d (TX sandy loam)<br>119 d (CA clay) | 44443402      | No Data                     |               | No Data                     |               | No Data                        |               |
| Fish bioconcentration factors (BCF)                        | 164× (edible)<br>575× (non-edible)<br>380× (whole fish)<br>(>96% eliminated within 14 days.)   | 43291706      | No Data                     |               | No Data                     |               | No Data                        |               |

### 3. Exposure Modeling

#### 3.1 Residues of Concern

The residues of concern (ROC) include the parent fipronil and three degradates (sulfide, sulfone, and desulfinyl) based on the Metabolism Assessment Review Committee (MARC) decision memo (USEPA 1996, DP 226435). The residues of concern are the same as considered in the previous DWA (USEPA 2006 and 2007; DP 322415).

#### 3.2 Input parameters for Surface and Groundwater Modeling

There are multiple approaches EPA can use to assess the risk of the total toxic residues (TTR) of a parent pesticide and its degradates of concern. Typically, EPA uses a total residues (TR) approach to assess chemicals with degradates of concern. The TR approach assumes the degradates (for which toxicity data are rarely available) are of equal toxicity in comparison with the parent compound (for which toxicity data are generally available). However, fipronil has degrade toxicity data that indicates enhanced or decreased toxicity relative to the parent compound depending upon the taxa assessed; therefore, the TR approach would not be appropriate.

An alternative approach for assessing the risk of the TTR of fipronil and its degradates is the FD approach (USEPA 2009b). This approach uses the FD routines in the PWC. The only additional inputs needed to run the FD routines are the formation fractions (FF) for each of the degradates and half-life estimates for each of degradates that describe the rates at which those degradates degrade. The FF (unitless) varies continuously from 0 to 1 and indicates the fraction of the parent compound degradation that forms a particular degrade. FF is calculated as the formation rate of the degrade divided by the degradation rate of the parent. The available physical/chemical and environmental fate properties of fipronil and its degradates of concern were used to calculate FD input parameters (**Table 4**). Notice that the formation fractions of the degradates produced through a fate pathway do not need to sum to 1 in Table 4 because only the degradates of concern are listed. FFs that do not sum to 1 simply indicate that the degradation of fipronil also produced degradates that were not of concern. Details of how these FD parameters are calculated are presented in **Appendix 4**.

**Table 4. PWC Chemical Input Parameters for Fipronil Residues of Concern**

| Parameter Description                      | Parameter Estimate (MRID #)     |                                 |                                 |                                 |
|--|---------------------------------|---------------------------------|---------------------------------|---------------------------------|
|  | Fipronil                        | Sulfide (MB 45950)              | Sulfone (MB 46136)              | Desulfinyl (MB46513)            |
| Molecular weight (g/mol)                   | 437.14 (44262826)               | 421.1 (44262826)                | 453.15 (44262826)               | 389.09 (44262826)               |
| Water Solubility (mg/L)                    | 2.3 (47723915)                  | 0.04 (USEPA 2007)               | 0.16 (44350001)                 | 0.95 (44350002)                 |
| Vapor pressure (torr; at 25°C)             | $7.5 \times 10^{-8}$ (47723916) | $1.7 \times 10^{-8}$ (44262803) | $5.7 \times 10^{-9}$ (44262802) | $3.0 \times 10^{-8}$ (44262801) |
| Soil K <sub>OC</sub> (g/mL)                | 727 <sup>1</sup> (44039003)     | 3911 <sup>1</sup> (44537902)    | 4208 <sup>1</sup> (44537901)    | 1290 <sup>1</sup> (44262831)    |
| Hydrolysis t <sub>1/2</sub> at pH 7 (days) | 2140 (42977905)                 | 806<br>FF = 0 (49151512)        | 416<br>FF = 0 (49151513)        | 720<br>FF = 0 (49151514)        |
| Aqueous Photolysis t <sub>1/2</sub> (days) | 0.34 (42918661)                 | Stable<br>FF = 0 (49151512)     | Stable<br>FF = 0 (49151513)     | 3.71<br>FF = 0.667 (42918661)   |

| Parameter Description                         | Parameter Estimate (MRID #)                    |  |   |                                       |
|---|--|--|---|---------------------------------------|
|   | Fipronil                                       | Sulfide (MB 45950)                           | Sulfone (MB 46136)                                  | Desulfinyl (MB46513)                  |
| <b>Excluding Unextracted Residues</b>         |  |  |   |                                       |
| Aerobic Soil Metabolism $t_{1/2}$ (days)      | $t_{1/2} = 349.4^2$<br>(44661301)              | $t_{1/2} = 370.9^2$<br>FF = 0.237 (44661301) | $t_{1/2} = 416.4^2$<br>FF = 0.743 (44661301)        | $t_{1/2} = 1183$<br>FF = 0 (44262830) |
| Aerobic Aquatic Metabolism $t_{1/2}$ (days)   | 30.2 <sup>3</sup><br>(MRID 44661301, 44261909) | Stable<br>FF = 0 (No Data)                   | Stable<br>FF = 0.884 (44261909, 44661301, 44661301) | 530<br>FF = 0 (49151518)              |
| Anaerobic Aquatic Metabolism $t_{1/2}$ (days) | 351.3<br>(MRID 44661301, 44261909)             | Stable<br>FF = 0 (49151519)                  | Stable<br>FF = 0.356 (44661301, 44261909)           | Stable<br>FF = 0 (49151519)           |
| <b>Including Unextracted Residues</b>         |  |  |   |                                       |
| Aerobic Soil Metabolism $t_{1/2}$ (days)      | $t_{1/2} = 379.3^2$<br>(44661301)              | $t_{1/2} = 482.2^2$<br>FF = 0.192 (44661301) | $t_{1/2} = 416.4^2$<br>FF = 0.108 (44661301)        | $t_{1/2} = 1818$<br>FF = 0 (44262830) |
| Aerobic Aquatic Metabolism $t_{1/2}$ (days)   | 31.6 <sup>3</sup><br>(MRID 44661301, 44261909) | Stable<br>FF = 0 (No Data)                   | Stable<br>FF = 0.930 (44261909, 44661301, 44661301) | 1668<br>FF = 0 (49151518)             |
| Anaerobic Aquatic Metabolism $t_{1/2}$ (days) | 449.7<br>(MRID 44661301, 44261909)             | Stable<br>FF = 0 (49151519)                  | Stable<br>FF = 0.498 (44661301, 44261909)           | Stable<br>FF = 0 (49151519)           |

FF = formation fraction.

<sup>1</sup> Mean KOC value (USEPA 2009a).

<sup>2</sup> Hydrolysis occurs in both the aerobic and anaerobic aquatic metabolism studies and therefore was accounted for in these studies half-life estimates in the aquatic environment. Adjustments were made to the aerobic soil metabolism half-life to account for hydrolysis in the terrestrial environment (see **Appendix 4**).

<sup>3</sup> 90<sup>th</sup> percentile of the observed half-lives.

The FFs and degradation half-lives of the ROCs can be calculated using a number of statistical packages as well as the solver component in Microsoft Excel. In this assessment, EFED's provisional 'Solver Tool' (ver. 8.8.2), which simultaneously fits single first-order (SFO) degradation kinetics for both parent and degradates, was used. Note that this tool is simply a macro-enabled Excel worksheet that runs the aforementioned solver component.

### 3.3 Surface Water Modeling

Surface water sourced drinking water exposure was estimated using the Tier II exposure model PWC (pesticide water calculator v1.52; December 8, 2015). The PWC is a graphical user interface that runs the Pesticide Root Zone Model (PRZM, v 5, November 15, 2006) and the Variable Volume Water Body Model (VWWM, 3/6/2014) (USEPA, 2006). A percentage crop area (PCA) of 1 is used because fipronil is used on both agricultural and non-agricultural uses (USEPA 2012). Potentially, the PCA could be refined, but was not since groundwater EDWCs do not use a PCA and are often higher than surface water EDWCs. The use pattern inputs for the PWC model are listed in **Table 5**.

**Table 5. PWC Scenarios and Input Parameters Describing Maximum Patterns of Fipronil Use on Representative Use Sites <sup>A</sup>**

| Use Site  | PWC Scenario (Weather file)                      | Date of Initial App. | App. Rate in lbs a.i./A (kg a.i./ha) | App. per Year                     | App. Interval (days) | CAM Input | Method (Depth in cm)             | Application Efficiency/Spray Drift |
|---|--|----------------------|--------------------------------------|-----------------------------------|----------------------|-----------|----------------------------------|------------------------------------|
| <i>Agricultural Use Sites</i>   |  |                      |                                      |                                   |                      |           |                                  |                                    |
| Potato  | NC sweet potato (W13722)                         | April 1              | 0.1 (0.112)                          | 1                                 | NA                   | 8         | In-furrow spray (10.16)          | 1/0 <sup>B</sup>                   |
| <i>Non-Agricultural Use Sites</i>   |  |                      |                                      |                                   |                      |           |                                  |                                    |
| Slit-placement for mole cricket control   | FL turf (W12834)                                 | Feb. 1               | 0.025 (0.028)                        | 2                                 | NS (180)             | 8         | In-slit granular (2)             | 1/0                                |
| Turfgrass and landscape beds, sod farms – fire ant quarantine states only (High application rate) | FL turf (W12834)                                 | Feb. 1               | 0.0125 (0.014)                       | 2                                 | NS (180)             | 2         | Granular – Broadcast (0)         | 1/0                                |
| Turfgrass, golf courses, sod farms – outside fire ant quarantine states (Low application rate)    | FL turf (W12834)                                 | Feb. 1               | 0.0000225 (0.0000252)                | 4                                 | NS (90)              | 2         | Broadcast or Mound treatment (0) | 1/0                                |
| Pine seedlings  | NC Apple (W03812)                                | Sept. 15             | 0.1314 (0.147)                       | 1/yr. in 3 of 4 yrs. <sup>B</sup> | NA                   | 8         | Mound injection (7.62)           | 1/0                                |
| Building perimeter – 1' up and 1' out   | Residential ROW and Impervious Combined (W13970) | Sept. 1              | 0.3267 (0.366)*                      | 2                                 | NS (180)             | 2         | Ground spray (0)                 | 1/0                                |
| Building perimeter – 2' up and 2' out   |  | Sept. 1              | 0.1838 (0.206)*                      | 2                                 | NS (180)             | 2         | Ground spray (0)                 | 1/0                                |
| Building perimeter – 3' up and 10' out (Tawny crazy ant) <sup>C</sup>                             |  | Sept. 1              | 0.3267 (0.366)*                      | 2                                 | NS (180)             | 2         | Ground spray (0)                 | 1/0                                |

<sup>A</sup> Source data are in **Table 2**.

<sup>B</sup> Spray drift is expected to be negligible from, and the application efficiency is expected to be 100% for, this use because the spray occurs within the open furrow below the surface of the surrounding field.

<sup>C</sup> Pine seedlings are grown in a rotation with a fallow year. Typically, the fallow may occur after 1, 2, or 3 years of uninterrupted seedling production (Starkey 2015). The modeled pine seedlings scenario uses the application scenario in which fipronil is applied in 3 of the 4 year rotation schedule (*i.e.*, most conservative in terms of highest EECs).

<sup>D</sup> The Section 18 Quarantine Exemption for Fipronil use to control tawny crazy ant around structures states “For exterior perimeter treatments, apply 0.06% Termidor SC finished dilution to surfaces up to but not to exceed 3 ft. up and 10 ft. of sod out from the foundation”. This statement is interpreted to exclude treatment of driveways that abut structures (*e.g.*, near where the driveway and garage door meet), but allow treatment 3 ft. up the garage door.

\* Application rate indicated refers to the application rate within the treated building perimeter area.

For consistency, modeled PWC scenarios are largely based on previously assessed scenarios for the potato, mole cricket, and pine seedling uses (USEPA 2007). Whereas USEPA (2007) had multiple turf application scenarios, this assessment simply brackets the turf usage with high and low application rate scenarios. Modeled application rates and numbers of applications per year include the maximum allowed on the labels. The building perimeter treatments are largely based on USEPA (2014), but updated to reflect changes made to the residential scenario for the upcoming pyrethroid risk assessment.

The EDWCs for fipronil ROCs from a surface water source are listed in **Tables 6 and 7**. **Table 6** is calculated from fate parameters that do not include unextracted residues and therefore represent a lower bound estimate of fipronil ROC EDWCs, while **Table 7** is based on fate parameters that include unextracted residues and therefore represent an upper bound estimate of fipronil ROC EDWCs. The highest surface water EDWCs are from the perimeter treatment for control of tawny crazy ant (**Table 7**), but are approximately an order of magnitude lower than the highest EDWCs predicted for groundwater. Graphical presentations of the daily fipronil ROC concentrations appear in **Appendix 2**.

**Table 6. Surface Water EDWCs for Fipronil and its Residues of Concern (ROCs) <sup>A</sup> based on Half-life Estimates that *Exclude* Unextracted Residues.**

| Scenario   | Application Method<br>(Depth in cm)    | Application Rate<br>(lbs ai/ha) and<br>Date (mm/dd) | Parent/<br>Degradate | Concentration (µg/L) (PCA = 1) |                                 |                              |
|--|--|---|----------------------|--------------------------------|---------------------------------|------------------------------|
|  |  |   |                      | 1 in 10 yr<br>Peak             | 1 in 10 yr<br>Annual<br>Average | 30 year<br>annual<br>average |
| Agricultural Use Sites   |  |   |                      |                                |                                 |                              |
| Potato   | In-furrow<br>spray (10.16)             | 0.1 (3/1)   | Fipronil             | 0                              | 0                               | 0                            |
|  |  |   | Sulfide              | 0                              | 0                               | 0                            |
|  |  |   | Sulfone              | 0                              | 0                               | 0                            |
|  |  |   | Desulfinyl           | 0                              | 0                               | 0                            |
| Non-Agricultural Use Sites   |  |   |                      |                                |                                 |                              |
| Slit-placement for mole<br>cricket control   | In-slit granular<br>(2)                | 0.025<br>(2/1 & 8/1)                                | Fipronil             | 0.00318                        | 0.000302                        | 0.000113                     |
|  |  |   | Sulfide              | 0.0000611                      | 0.0000342                       | 0.0000249                    |
|  |  |   | Sulfone              | 0.00101                        | 0.000933                        | 0.000629                     |
|  |  |   | Desulfinyl           | 0.000532                       | 0.000430                        | 0.000257                     |
| Turfgrass and landscape beds,<br>sod farms – fire ant quarantine<br>states only (High application<br>rate) | Granular –<br>Broadcast (0)            | 0.0125<br>(2/1 & 8/1)                               | Fipronil             | 0.0657                         | 0.00716                         | 0.00380                      |
|  |  |   | Sulfide              | 0.00230                        | 0.00150                         | 0.00120                      |
|  |  |   | Sulfone              | 0.0362                         | 0.0324                          | 0.0237                       |
|  |  |   | Desulfinyl           | 0.0152                         | 0.0118                          | 0.00861                      |
| Turfgrass, golf courses, sod<br>farms – outside fire ant<br>quarantine states (Low<br>application rate)    | Broadcast or<br>Mound<br>treatment (0) | 0.0000225 (2/1,<br>5/1, 8/1, & 11/1)                | Fipronil             | 0.000207                       | 0.0000292                       | 0.0000144                    |
|  |  |   | Sulfide              | 7.77E-6                        | 5.21E-6                         | 4.02E-6                      |
|  |  |   | Sulfone              | 0.000128                       | 0.000105                        | 0.0000827                    |
|  |  |   | Desulfinyl           | 0.0000589                      | 0.0000445                       | 0.0000327                    |
| Pine seedlings   | Mound<br>injection<br>(7.62)           | 0.1314 (3/1)  | Fipronil             | 0                              | 0                               | 0                            |
|  |  |   | Sulfide              | 0                              | 0                               | 0                            |
|  |  |   | Sulfone              | 0                              | 0                               | 0                            |
|  |  |   | Desulfinyl           | 0                              | 0                               | 0                            |
| Building perimeter – 1’ up and<br>1’ out   | Ground spray<br>(0)                    | 0.3267* (3/1 &<br>9/1)                              | Fipronil             | 0.603                          | 0.0410                          | 0.0273                       |
|  |  |   | Sulfide              | 0.00241                        | 0.00101                         | 0.000781                     |
|  |  |   | Sulfone              | 0.0540                         | 0.0231                          | 0.0187                       |
|  |  |   | Desulfinyl           | 0.0359                         | 0.0126                          | 0.00929                      |
| Building perimeter – 2’ up and<br>2’ out   | Ground spray<br>(0)                    | 0.1838* (3/1 &<br>9/1)                              | Fipronil             | 0.679                          | 0.0463                          | 0.0309                       |
|  |  |   | Sulfide              | 0.00275                        | 0.00116                         | 0.000894                     |
|  |  |   | Sulfone              | 0.0611                         | 0.0263                          | 0.0213                       |
|  |  |   | Desulfinyl           | 0.0405                         | 0.0143                          | 0.0106                       |
| Building perimeter – 3’ up and<br>10’ out (Tawny crazy ant)  | Ground spray<br>(0)                    | 0.3267* (3/1 &<br>9/1)                              | Fipronil             | 1.12                           | 0.131                           | 0.0921                       |
|  |  |   | Sulfide              | <b>0.0183</b>                  | <b>0.00799</b>                  | <b>0.00604</b>               |
|  |  |   | Sulfone              | 0.203                          | 0.133                           | 0.105                        |
|  |  |   | Desulfinyl           | 0.102                          | 0.0616                          | 0.0480                       |

<sup>A</sup> Residues of concern – “sulfide” = fipronil sulfide, “sulfone” = fipronil sulfone, and “desulfinyl” = fipronil desulfinyl.

\* Application rate indicated refers to the application rate within the treated building perimeter area.

**Table 7. Surface Water EDWCs for Fipronil and its Residues of Concern (ROCs) <sup>A</sup> based on Half-life Estimates that *Include* Unextracted Residues.**

| Scenario  | Application Method<br>(Depth in cm) | Application Rate<br>(lbs ai/ha) and Date (mm/dd) | Parent/<br>Degradate | Concentration (µg/L) (PCA = 1) |                           |                        |
|---|-------------------------------------|--|----------------------|--------------------------------|---------------------------|------------------------|
|   |                                     |  |                      | 1 in 10 yr Peak                | 1 in 10 yr Annual Average | 30 year annual average |
| Agricultural Use Sites  |                                     |  |                      |                                |                           |                        |
| Potato  | In-furrow spray (10.16)             | 0.1 (3/1)  | Fipronil             | 0                              | 0                         | 0                      |
|   |                                     |  | Sulfide              | 0                              | 0                         | 0                      |
|   |                                     |  | Sulfone              | 0                              | 0                         | 0                      |
|   |                                     |  | Desulfinyl           | 0                              | 0                         | 0                      |
| Non-Agricultural Use Sites  |                                     |  |                      |                                |                           |                        |
| Slit-placement for mole cricket control   | In-slit granular (2)                | 0.025 (2/1 & 8/1)                                | Fipronil             | 0.00319                        | 0.000309                  | 0.000116               |
|   |                                     |  | Sulfide              | 0.0000465                      | 0.0000263                 | 0.0000192              |
|   |                                     |  | Sulfone              | 0.00104                        | 0.000959                  | 0.000644               |
|   |                                     |  | Desulfinyl           | 0.000684                       | 0.000564                  | 0.000355               |
| Turfgrass and landscape beds, sod farms – fire ant quarantine states only (High application rate) | Granular – Broadcast (0)            | 0.0125 (2/1 & 8/1)                               | Fipronil             | 0.0659                         | 0.00743                   | 0.00395                |
|   |                                     |  | Sulfide              | 0.00186                        | 0.00121                   | 0.000968               |
|   |                                     |  | Sulfone              | 0.0370                         | 0.0332                    | 0.0243                 |
|   |                                     |  | Desulfinyl           | 0.0191                         | 0.0164                    | 0.0121                 |
| Turfgrass, golf courses, sod farms – outside fire ant quarantine states (Low application rate)    | Broadcast or Mound treatment (0)    | 0.0000225 (2/1, 5/1, 8/1, & 11/1)                | Fipronil             | 0.000208                       | 0.0000303                 | 0.0000149              |
|   |                                     |  | Sulfide              | 6.25E-6                        | 4.20E-6                   | 3.24E-6                |
|   |                                     |  | Sulfone              | 0.000130                       | 0.000107                  | 0.0000846              |
|   |                                     |  | Desulfinyl           | 0.0000744                      | 0.0000608                 | 0.0000455              |
| Pine seedlings  | Mound injection (7.62)              | 0.1314 (3/1)                                     | Fipronil             | 0                              | 0                         | 0                      |
|   |                                     |  | Sulfide              | 0                              | 0                         | 0                      |
|   |                                     |  | Sulfone              | 0                              | 0                         | 0                      |
|   |                                     |  | Desulfinyl           | 0                              | 0                         | 0                      |
| Building perimeter – 1’ up and 1’ out   | Ground spray (0)                    | 0.3267* (3/1 & 9/1)                              | Fipronil             | 0.604                          | 0.0417                    | 0.0278                 |
|   |                                     |  | Sulfide              | 0.00205                        | 0.000870                  | 0.000672               |
|   |                                     |  | Sulfone              | 0.0548                         | 0.0235                    | 0.0190                 |
|   |                                     |  | Desulfinyl           | 0.0365                         | 0.0134                    | 0.0100                 |
| Building perimeter – 2’ up and 2’ out   | Ground spray (0)                    | 0.1838* (3/1 & 9/1)                              | Fipronil             | 0.680                          | 0.0471                    | 0.0315                 |
|   |                                     |  | Sulfide              | 0.00235                        | 0.000996                  | 0.000768               |
|   |                                     |  | Sulfone              | 0.0619                         | 0.0268                    | 0.0217                 |
|   |                                     |  | Desulfinyl           | 0.0412                         | 0.0152                    | 0.0114                 |
| Building perimeter – 3’ up and 10’ out (Tawny crazy ant)  | Ground spray (0)                    | 0.3267* (3/1 & 9/1)                              | Fipronil             | <b>1.13</b>                    | <b>0.134</b>              | <b>0.0949</b>          |
|   |                                     |  | Sulfide              | 0.0159                         | 0.00691                   | 0.00523                |
|   |                                     |  | Sulfone              | <b>0.205</b>                   | <b>0.135</b>              | <b>0.107</b>           |
|   |                                     |  | Desulfinyl           | <b>0.108</b>                   | <b>0.0682</b>             | <b>0.0531</b>          |

<sup>A</sup> Residues of concern – “sulfide” = fipronil sulfide, “sulfone” = fipronil sulfone, and “desulfinyl” = fipronil desulfinyl.

\* Application rate indicated refers to the application rate within the treated building perimeter area.

### 3.4 Groundwater Modeling

Groundwater sourced drinking water exposure was estimated using the Tier II exposure model PWC (v1.52; December 8, 2015). The PWC incorporates the Tier I PRZM-GW model, which is a one-dimensional, finite-difference model that estimates the concentrations of pesticides in groundwater. It accounts for pesticide fate in the crop root zone by simulating pesticide soil transport and degradation after a pesticide is applied to an agricultural field. It permits the assessment of multiple years of pesticide application (up to 100 years) on a single site. Six standard scenarios, each representing a different region known to be vulnerable to groundwater

contamination, are available for the simulations. The output values represent pesticide concentrations in a vulnerable groundwater supply that is located directly beneath a rural agricultural field following many years of pesticide application. The breakthrough time (*i.e.*, the number of days that it takes for the applied chemical to reach the aquifer) is simulated for 30 years (or for 100 years using extended weather files) to determine EDWCs.

The EDWCs for fipronil ROCs from a groundwater source are listed in **Table 8**. Similar to the surface water EDWC tables, the top portion of **Table 8** is calculated based on fate parameters that do not include unextracted residues and therefore represent a lower bound estimate of fipronil ROC EDWCs, while the bottom portion of **Table 8** is based on fate parameters that include unextracted residues and therefore represent an upper bound estimate of fipronil ROC EDWCs. The highest groundwater EDWCs are from the Wisconsin scenario (the bottom portion of **Table 8**). These are the highest EDWCs from either ground or surface water drinking water sources. Therefore, EFED recommends **14.5 µg/L** for the 1-in-10 year acute EDWC and **13.5 µg/L** for the 1-in-10 year chronic EDWC for fipronil alone.

**Table 8. Groundwater EDWCs for Fipronil, Fipronil Sulfide, and Fipronil Sulfone based on the 90<sup>th</sup> Percentile Soil Parameters<sup>A</sup>**

| Crop/Scenario                                 | Parent/<br>Degradate | Highest Daily Value<br>(µg/L) | Post Breakthrough<br>Average (µg/L) | Average Simulation<br>Breakthrough Time<br>(Days) |
|---|----------------------|-------------------------------|-------------------------------------|---|
| <b>Excludes Unextracted Residues</b>          |                      |                               |                                     |   |
| DELMARVA Sweet Corn<br>Met File (13781.dvf)   | Fipronil             | 7.99                          | 7.51                                | 9801  |
|   | Sulfide              | 0.123                         | NA                                  | NA  |
|   | Sulfone              | 0.233                         | NA                                  | NA  |
| Florida Citrus<br>Met File (12842.dvf)        | Fipronil             | 7.23                          | 6.68                                | 8006  |
|   | Sulfide              | <b>0.280</b>                  | NA                                  | NA  |
|   | Sulfone              | <b>0.576</b>                  | NA                                  | NA  |
| Florida Potato<br>Met File (13889.dvf)        | Fipronil             | 0.555                         | 0.505                               | 13,732  |
|   | Sulfide              | 0.0226                        | NA                                  | NA  |
|   | Sulfone              | 0.0521                        | NA                                  | NA  |
| Georgia Peanuts<br>Met File (w93805.dvf)      | Fipronil             | 2.55                          | 2.43                                | 12,294  |
|   | Sulfide              | 0.00439                       | NA                                  | NA  |
|   | Sulfone              | 0.00535                       | NA                                  | NA  |
| North Carolina Cotton<br>Met File (13722.dvf) | Fipronil             | 6.85                          | 6.10                                | 8822  |
|   | Sulfide              | 0.242                         | NA                                  | NA  |
|   | Sulfone              | 0.339                         | NA                                  | NA  |
| Wisconsin Corn<br>Met File (14920.dvf)        | Fipronil             | 13.7                          | 12.8                                | 11,766  |
|   | Sulfide              | 0.0794                        | NA                                  | NA  |
|   | Sulfone              | 0.110                         | NA                                  | NA  |
| <b>Includes Unextracted Residues</b>          |                      |                               |                                     |   |
| DELMARVA Sweet Corn<br>Met File (13781.dvf)   | Fipronil             | 8.67                          | 8.13                                | 9801  |
|   | Sulfide              | 0.111                         | NA                                  | NA  |
|   | Sulfone              | 0.218                         | NA                                  | NA  |
| Florida Citrus<br>Met File (12842.dvf)        | Fipronil             | 7.78                          | 7.18                                | 8006  |
|   | Sulfide              | <b>0.254</b>                  | NA                                  | NA  |
|   | Sulfone              | <b>0.536</b>                  | NA                                  | NA  |
| Florida Potato<br>Met File (13889.dvf)        | Fipronil             | 0.660                         | 0.605                               | 13,732  |
|   | Sulfide              | 0.0233                        | NA                                  | NA  |
|   | Sulfone              | 0.0536                        | NA                                  | NA  |
| Georgia Peanuts<br>Met File (w93805.dvf)      | Fipronil             | 2.78                          | 2.65                                | 12,294  |
|   | Sulfide              | 0.00395                       | NA                                  | NA  |

| Crop/Scenario                                 | Parent/<br>Degradate | Highest Daily Value<br>(µg/L) | Post Breakthrough<br>Average (µg/L) | Average Simulation<br>Breakthrough Time<br>(Days) |
|---|----------------------|-------------------------------|-------------------------------------|---|
|   | Sulfone              | 0.00501                       | NA                                  | NA  |
| North Carolina Cotton<br>Met File (13722.dvf) | Fipronil             | 7.54                          | 6.71                                | 8822  |
|   | Sulfide              | 0.227                         | NA                                  | NA  |
|   | Sulfone              | 0.322                         | NA                                  | NA  |
| Wisconsin Corn<br>Met File (14920.dvf)        | Fipronil             | <b>14.5</b>                   | <b>13.5</b>                         | 11,766  |
|   | Sulfide              | 0.0675                        | NA                                  | NA  |
|   | Sulfone              | 0.100                         | NA                                  | NA  |

<sup>A</sup> Maximum values are in bold.

However, the recommendations for fipronil degradates are not as obvious. The highest modeled acute EDWCs for fipronil sulfide and sulfone are produced in groundwater. Chronic values in groundwater are based on a post-breakthrough average, but in the case of these fipronil degradates, breakthrough did not occur in the 100 years simulated. Additionally, the fipronil desulfinyl degradate does not occur in groundwater modeling since fipronil desulfinyl is produced through photolytic reactions and such reactions are not considered in EFED's groundwater models. Finally, the USGS NAWQA data set contains many samples with sulfone concentrations that exceed the EFED modeled sulfone concentrations by an order of magnitude or more.

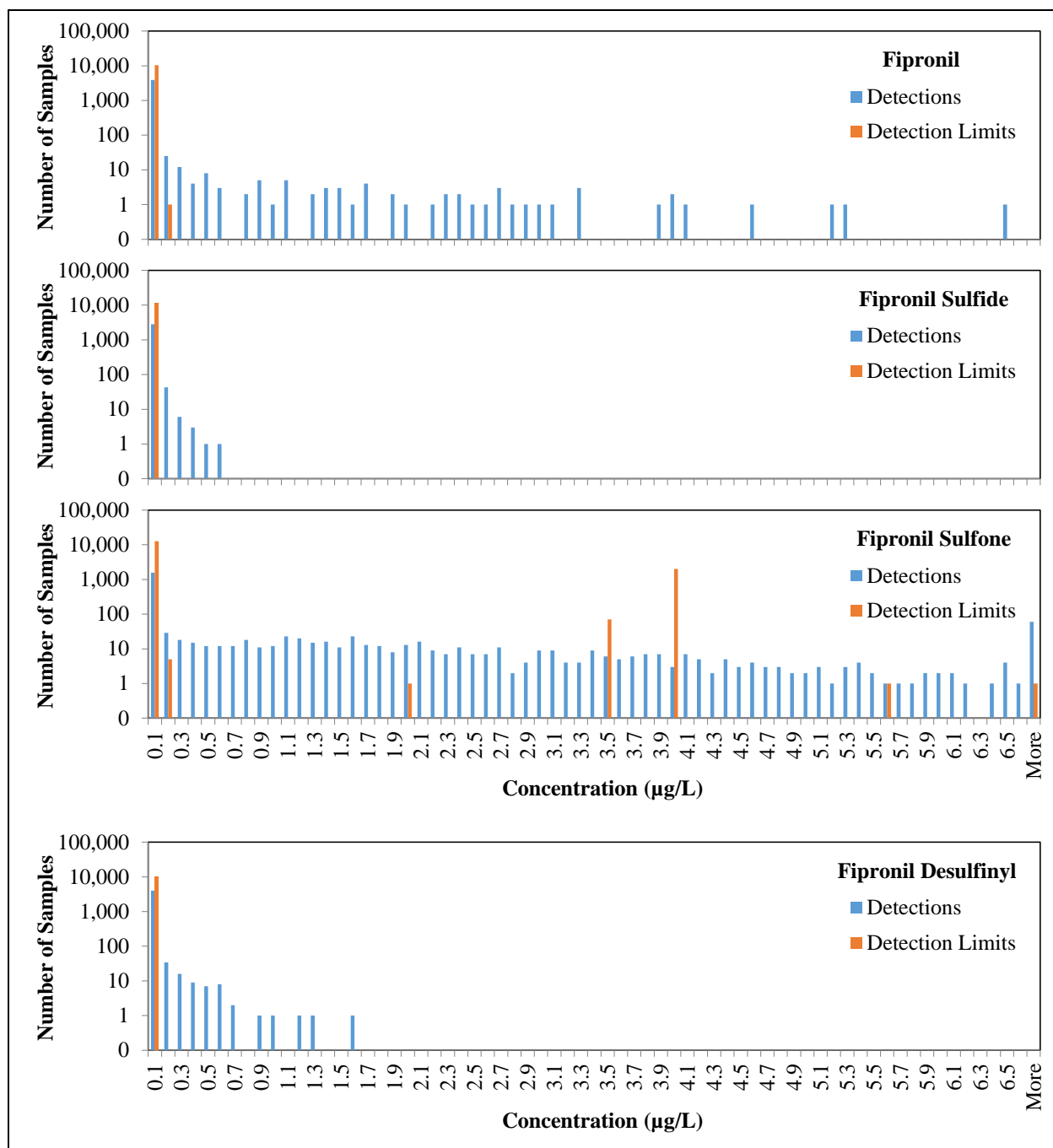
#### 4. Monitoring Data

A search of the NAWQA data set for fipronil and its degradates of concern was performed on July 24, 2013 and October 2, 2015. The 2013 search included groundwater data from California only, whereas the 2015 search included surface water only, but from across the entire United States.

Since these searches, public access to the NAWQA data set no longer occurs through the same USGS website. Access to the NAWQA monitoring data now occurs through the Water Quality Portal (WQP) website (<http://waterqualitydata.us/>), which integrates public available water quality data from the USGS National Water Information System (NWIS), the EPA STORage and RETrieval (STORET) Data Warehouse, and the USDA ARS Sustaining The Earth's Watersheds Agricultural Research Database System (STEWARDS). However, an attempt to access fipronil ROC data on August 9 and 10, 2016 did not meet with success. Data from STORET was accessible for all four ROCs, while USGS data could only be obtained for fipronil and fipronil sulfide. Since EPA had more confidence in the accuracy of the 2015 surface water and 2013 groundwater data downloads from the NAWQA database and because the NAWQA data are likely to be the largest data source for fipronil ROCs, this DWA monitoring data section is based on the 2013 and 2015 NAWQA data searches. For the Fipronil Registration Review Ecological Risk Assessment, a more comprehensive review of fipronil ROC data from multiple data sources will be attempted.

The histograms presented in **Figure 2** summarize the data contained in the 2015 NAWQA surface water data set. Note that the Y-axis is log transformed, and the X-axis is the same for all four histograms and is based on the range of fipronil detected in the 2015 NAWQA data set.

Further note that fipronil sulfone had sixty samples (maximum of 203 µg/L) that exceeded the upper concentration range of the parent fipronil. Red bars indicate the concentration at which detection limits occurred with the height of the bar indicating the number of samples that did not exceed the detection limit at that concentration. This variability in detection limits between samples is especially important for interpreting fipronil sulfone monitoring data. While the 10,224 samples described as less than the detection limit at 0.1 µg/L can be reasonably inferred to have relatively low levels of fipronil sulfone, the same cannot be inferred to the 2089 samples described as less than a detection limit of 3.5 µg/L or greater.



**Figure 2. Graphical Summary of Fipronil Residues of Concern (ROCs) in Filtered Surface Water Monitoring Data from the NAWQA (USGS) Data Set.**

**Table 9** presents a set of summary statistics for fipronil residues of concern (ROCs) in both filtered surface water and filtered groundwater monitoring data from the 2015 and 2013 NAWQA data sets respectively. Of the 572 samples in the NAWQA groundwater data set, only two groundwater samples detected fipronil ROCs. In Stanislaus County, CA, a sample from 9/1/04 detected fipronil desulfinyl at 0.0073 µg/L from a well (station ID# 374110121000301). No other ROCs were detected in this sample. The second sample is from Orange County, CA

(station ID# 335210117422801) on 6/10/09 and indicated concentrations of 0.0073 (fipronil), 0.006 (sulfide), 0.0056 (sulfone), and 0.006 µg/L (desulfinyl).

**Table 9. Summary Statistics for Fipronil Residues of Concern (ROCs) in Filtered Surface and Groundwater Monitoring Data from the NAWQA (USGS) Data Set.**

| Summary Metric                             | Fipronil      | Sulfide (MB 45950) | Sulfone (MB 46136) | Desulfinyl (MB46513) |
|--|---------------|--------------------|--------------------|----------------------|
| <b>Filtered Surface Water Samples</b>      |               |                    |                    |                      |
| Maximum Concentration (µg/L)               | 6.41          | 0.507              | 203                | 1.54                 |
| 95 <sup>th</sup> %ile Concentration (µg/L) | 0.04          | 0.013              | <4*                | 0.012                |
| 90 <sup>th</sup> %ile Concentration (µg/L) | 0.02          | 0.013              | <4*                | 0.012                |
| Median Concentration (µg/L)                | 0.016         | 0.012              | 0.024*             | 0.0064               |
| Detection Limit Range (µg/L)               | 0.0029 – 0.12 | 0.0018 – 0.080     | 0.0013 – 80        | 0.0016 – 0.080       |
| # Less than Detection Limit                | 10,441 (72%)  | 11,556 (80%)       | 12,318 (85%)       | 10,318 (72%)         |
| # Samples Detected                         | 4007 (28%)    | 2862 (20%)         | 2129 (15%)         | 4110 (28%)           |
| Total Samples                              | 14,448        | 14,428             | 14,447             | 14,428               |
| <b>Groundwater Samples</b>                 |               |                    |                    |                      |
| Maximum Concentration (µg/L)               | 0.0073        | 0.006              | 0.0056             | 0.0073               |
| Detection Limit Range (µg/L)               | 0.007 – 0.04  | 0.005 – 0.013      | 0.005 – 0.04       | 0.004 – 0.012        |
| # Less than Detection Limit                | 571 (99.8%)   | 571 (99.8%)        | 571 (99.8%)        | 570 (99.7%)          |
| # Samples Detected                         | 1 (0.2%)      | 1 (0.2%)           | 1 (0.2%)           | 2 (0.3%)             |
| Total Samples                              | 572           | 572                | 572                | 572                  |

\* The surface water sample detection limits vary greatly for fipronil sulfone (Figure 2) with a large number of samples having a relatively high detection limit of 4 µg/L, while other samples have detection limits as low as 0.0013 µg/L. Therefore, both the 95<sup>th</sup> and 90<sup>th</sup> percentile values are known only to be less than the 4 µg/L detection limit, but the median is measured as 0.024 µg/L.

An important component not presented in this analysis is the spatial distribution of fipronil contamination. Some sites consistently have high concentrations, while most non-targeted sites do not. For example, all of the 46 samples that had fipronil concentrations in excess of 1 µg/L came from two sampling sites in Louisiana, and of the 106 samples that exceed 0.1 µg/L of fipronil only 8 samples are not from Louisiana. Similarly, 53 of 54 and 81 of the 82 exceeding 0.1 µg/L of fipronil sulfide and fipronil desulfinyl, respectively, are from Louisiana. However, of the 422 samples that exceed 1 µg/L of fipronil sulfone, only 4 are from Louisiana. Potentially, the receiving water characteristics play an important role in determining the degradation pathway of fipronil once in the aquatic environment.

Several monitoring projects were discussed in the previous DWA (USEPA 2006). However, some of the targeted monitoring projects discussed are for uses that are no longer allowed for fipronil.

## 5. Recommendations

The modeled surface water EDWCs are generally supported by the non-targeted USGS NAWQA program's surface water monitoring data with both the acute and chronic EDWCs being comparable to the maximum and 95<sup>th</sup> percentile values from monitoring. The maximum values from NAWQA surface water monitoring are 6.41, 0.507, 203, and 1.54 µg/L for fipronil, sulfide, sulfone, and desulfinyl, whereas the 95<sup>th</sup> percentile surface water monitoring values are 0.04, 0.013, <4, and 0.012 µg/L, respectively. Note that both the acute and chronic surface water EDWCs fall between the maximum and 95<sup>th</sup> percentile monitoring values for fipronil and desulfinyl, whereas only the acute does for sulfide with the chronic and cancer EDWCs falling

slightly below the 95<sup>th</sup> percentile value. Such comparisons are made difficult for fipronil sulfone because many of the USGS samples have a relatively high detection limit of 3.5 µg/L or greater relative to other fipronil sulfone samples which have detection limits as low as 0.0013 µg/L.

Nonetheless, the NAWQA data set (summarized in **Appendix 5**) contains many samples with fipronil sulfone concentrations that inexplicably, are an order of magnitude or more higher than would be expected from the current pesticidal use scenarios modeled in this document and/or historical uses. The highest sulfone value of 203 µg/L seems questionable since it occurs at a site in Idaho at which 118 of 119 samples did not detect sulfone (possibly this sample is a mislabeled spiked sample). Many of the other high sulfone values are from small watersheds (<1000 mi<sup>2</sup>) whose values would not be representative of a drinking source water. However, 88.5% of the 26 samples from the North Canadian River near Harrah, Oklahoma (Station ID 7241550; watershed drainage area of 13,775 mi<sup>2</sup>) detected sulfone with a peak concentration of 4.6 µg/L and an average concentration of 3.2 µg/L calculated as the average of the detected concentrations (non-detects not included; all detection limits of non-detects ≥4 µg/L). If the Health Effects Division wants to use the higher monitored values in its risk assessment, EFED would recommend these North Canadian River values. These EDWC recommendations supersede all previous recommendations (USEPA 2006; DP 322415).

Based upon this assessment, EFED recommends the following EDWCs of **14.5 µg/L** for the 1-in-10 year daily peak EDWC (acute) and **13.5 µg/L** for the 1-in-10 year chronic and cancer EDWC for fipronil. For sulfide, EFED recommends **0.254 µg/L** (acute), **0.00799 µg/L** (chronic), and **0.00604 µg/L** (cancer) EDWCs. For desulfinyl, EFED recommends **0.108 µg/L** (acute), **0.0682 µg/L** (chronic), and **0.0531 µg/L** (cancer) EDWCs. The recommendations for fipronil, sulfide and desulfinyl are all based on EFED modeling. For sulfone, EFED recommends either:

- **0.536 µg/L** (acute), **0.135 µg/L** (chronic), and **0.107 µg/L** (cancer) EDWCs based on EFED modeling; or
- **4.6 µg/L** (acute), **3.2 µg/L** (chronic), and **3.2 µg/L** (cancer) EDWCs based on NAWQA monitoring data.

Note that the modeled EDWCs are based on degradation rates that account for the potential for unextracted residues to be degradates of concern (*i.e.*, these EDWCs are “conservatively” calculated in the sense that they are more protective of human health). However, excluding unextracted residues would produce only limited reductions in the EDWCs (*e.g.*, the acute fipronil EDWC would change from 14.5 to 13.8 µg/L). Graphical presentations of the daily fipronil ROC concentrations appear in **Appendix 2**.

## **6. Uncertainties, Assumptions, and Limitations**

The fipronil application information is mostly complete. Application information for some registered uses are not specified (NS) in **Table 2**, such as the maximum number of applications per year and the minimum retreatment intervals. To the extent that any use exceeds the assumptions made in this DWA in the absence of clear label directions, the DWA may under-predict exposure.

There is some uncertainty associated with FD FF and half-lives calculated from metabolism data because the degradation observed in these studies deviates to some degree from that predicted by

first-order regression equations. However, fitting such equations simultaneously in a manner that enforces a mass balance across the equations is expected to minimize such discrepancies.

The upper end concentrations observed in the non-targeted NAWQA surface water monitoring data roughly corresponds to the concentrations predicted in the EPA standard surface water reservoir for the current uses. Often for other pesticides, the non-targeted monitoring data are lower than the model predicted concentrations. Potentially, the persistence of the fipronil ROCs explains the better correspondence between monitored and modeled. Less persistent pesticides would exhibit more “flashy” behavior (*i.e.*, producing concentration spikes after runoff events that rapidly diminish in short periods of time) that decreases the chances of infrequent sampling capturing these high concentration events. The more persistent fipronil ROCs would likely produce longer-lived ‘spikes’ in concentration that might persist longer, travel further downstream, and be better captured by infrequent monitoring. Additionally, many NAWQA sampling stations tend to be located in urban/suburban areas where many of the remaining fipronil uses (*e.g.*, turf and building perimeter uses) occur.

On the other hand, the highest non-targeted groundwater monitoring data is much lower than the predictions of EPA’s current groundwater model. Additionally, only two samples indicated the presence of fipronil ROCs. However, the chances are small of any particular non-targeted monitoring well co-occurring within an area to which fipronil is applied since the spatial extent of fipronil applications is very small relative to pesticides that have major agricultural uses. Furthermore, some fipronil uses such as termiticide uses have specific label language regarding well setbacks to prevent well contamination.

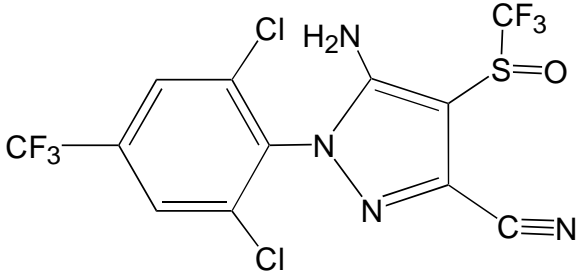
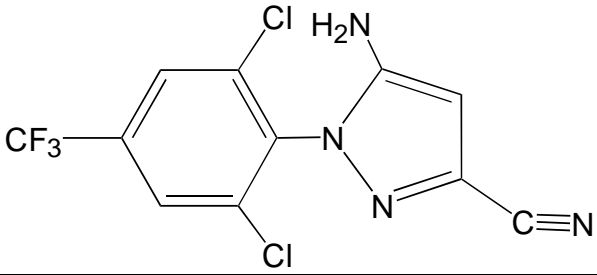
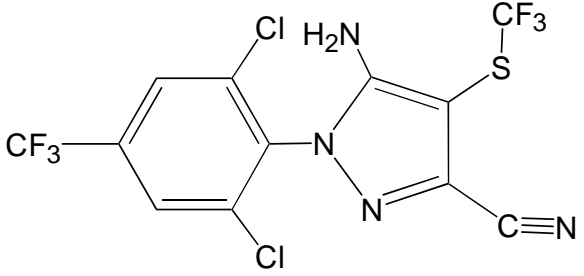
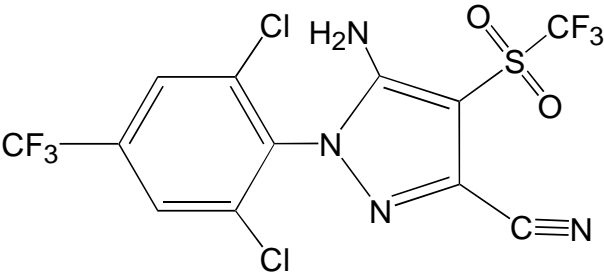
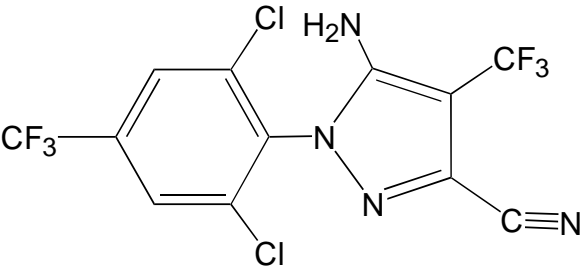
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## APPENDIX 1. Chemical Names, Structures, and Maximum Reported Amounts of Fipronil and its Degradates and an Overview of Degradation Pathways.

**Appendix 1 Table 1. Chemical Names and Structures of Fipronil and its Degradates.**

| Parent/ Degradate Name   | Structure  |
|--|--|
| <b>Fipronil (MB 46030)</b><br><br>IUPAC name: 5-amino-1-(2,6-dichloro- $\alpha,\alpha,\alpha$ -trifluoro-p-tolyl)-4-trifluoromethylsulfinylpyrazole-3-carbonitrile<br><br>CAS name: 5-amino-1-[2,6-dichloro-4-(trifluoromethyl)phenyl]-4-[(trifluoromethyl)sulfinyl]-1H-pyrazole-3-carbonitrile<br><br>SMILES: <chem>CLc1cc(C(F)(F)F)cc(Cl)c1n2c(N)c(S(=O)C(F)(F)F)c(C#N)n2</chem> |    |
| <b>MB 45897</b><br><br>CAS name: 5-amino-1-(2,6-dichloro-alpha,alpha,alpha-trifluoro-p-tolyl)-1H-pyrazole-3-carbonitrile<br><br>SMILES: <chem>C(#N)C1C=C(N)N(c2c(Cl)cc(C(F)(F)F)cc2Cl)N=1</chem>   |    |
| <b>Fipronil sulfide (MB 45950)</b><br><br>CAS name: 5-amino-1-(2,6-dichloro-4-(trifluoromethyl)phenyl)-4-trifluoromethylthio-1-pyrazole-3-carbonitrile<br><br>SMILES: <chem>C(#N)c1c(SC(F)(F)F)c(N)n(c2c(Cl)cc(C(F)(F)F)cc2Cl)n1</chem>  |  |
| <b>Fipronil sulfone (MB 46136)</b><br><br>CAS name: 5-amino-1-(2,6-dichloro-a,a,a-trifluoro-p-tolyl)-4-trifluoro-methylsulfonylpyrazole-3-carbonitrile<br><br>SMILES: <chem>C(#N)C1C(S(=O)(=O)C(F)(F)F)=C(N)N(c2c(Cl)cc(C(F)(F)F)cc2Cl)N=1</chem>  |  |
| <b>Fipronil desulfinyl (MB 46513)</b><br><br>CAS name: 5-amino-1-(2,6-dichloro-alpha,alpha,alpha-trifluoro-p-tolyl)-4-trifluoro-methylpyrazole-3-carbonitrile<br><br>SMILES: <chem>C(F)(F)F)c1c(C(#N))nn(c2c(Cl)cc(C(F)(F)F)cc2Cl)c1N</chem>   |  |

| Parent/ Degradate Name   | Structure |
|--|-----------|
| <b>RPA 104615</b><br>CAS name: 5-amino-3-cyano-1-(2,6-dichloro-4-trifluoromethylphenyl) pyrazole-4-sulfonic acid, potassium<br>SMILES: <chem>C(#N)C1C(S(=O)(=O)O)=C(N)N(c2c(Cl)cc(C(F)(F)F)cc2Cl)N=1</chem>                                  |           |
| <b>RPA 105048</b><br>CAS name: 1-(2,6-dichloro-4-trifluoromethylphenyl)-3-amino-5-amino-4-trifluoromethylsulfonylpyrazole<br>SMILES: <chem>C(F)(F)(F)C1C(C(N)=O)=NN(c2c(Cl)cc(C(F)(F)F)cc2Cl)C=1N</chem>                                     |           |
| <b>Fipronil amide (RPA 200766)</b><br>CAS name: 5-amino-1-(2,6-dichloro-4-(trifluoromethyl)phenyl)-4-trifluoromethylsulfonyl-1H-pyrazole-3-carboxamide<br>SMILES: <chem>C(N)(=O)C1C(S(=O)C(F)(F)F)=C(N)N(c2c(Cl)cc(C(F)(F)F)cc2Cl)N=1</chem> |           |

**Appendix 1 Table 2. Maximum Reported Amounts of Fipronil Degradation Products.**

| Degradate                          | Maximum % of Applied (µg/L or µg/kg in Field Studies)   | Study Type   | MRID   |
|------------------------------------|---|--|--|
| <b>MB 45897</b>                    | <i>Laboratory studies</i>   |  |  |
|                                    | 0.76% (252 d)   | Aerobic soil metabolism  | 42918663   |
|                                    | 1.0% (120 d)  | Anaerobic aquatic metabolism   | 43291704   |
|                                    | 14.16% TRR (uptake edible)<br>22.92% TRR (uptake inedible)<br>24.28% TRR (uptake whole fish)<br>31.97% TRR (depuration edible)<br>47.87% TRR (depuration inedible)<br>26.14% TRR (depuration whole) | Bioaccumulation in Fish  | 43291707   |
|                                    | <i>Laboratory studies</i>   |  |  |
|                                    | 12.7% (30 d, Control)<br>4.88% (336 d)<br>47.0% (365 d)<br>82.6% (365 d)<br>17% (35 d, 0-14 cm soil section)  | Soil photolysis<br>Aerobic soil metabolism<br>Anaerobic aquatic metabolism<br>Aerobic aquatic metabolism<br>Aged column leaching | 42918662<br>42918663<br>43291704<br>44261909<br>42918664 |
| <b>Fipronil sulfide (MB 45950)</b> | 9.04% TRR (uptake edible)<br>9.03% TRR (uptake inedible)<br>8.55% TRR (uptake whole fish)<br>15.49% TRR (depuration edible)<br>16.33% TRR (depuration inedible)                                     | Bioaccumulation in Fish  | 43291707   |

| Degradate                              | Maximum % of Applied (µg/L or µg/kg in Field Studies)   | Study Type   | MRID   |
|--|---|--|--|
|  | 11.21% TRR (depuration whole)   |  |  |
|  | <i>Terrestrial field dissipation studies</i>  |  |  |
|  | 66.6 µg/kg (12 m)<br>62.8 µg/kg (12 m)<br>49.9 µg/kg (8 m)<br>44.5 µg/kg (16 m)   | 18-m CA In furrow corn<br>18-m NE In furrow corn<br>18-m NC In furrow corn<br>18-m WA In furrow corn   | 43401103                                     |
|  | 8.3 µg/kg (after application 2)<br>11.5 µg/kg (183 d)   | 490 d CA foliar cotton<br>548 d WA foliar potato   | 44262826                                     |
|  | <i>Aquatic field dissipation studies</i>  |  |  |
|  | Water: 0.49 µg/L (3.9 d)<br>Sed./Soil: 7.3 µg/kg (drain ditch)<br>Water: 0.26 µg/L (-1 d)<br>Sed./Soil: 5.9 µg/kg (drain ditch)<br>Water: 0.15 µg/L (1 d)<br>Sed./Soil: 4.0 µg/kg (drain ditch)<br>Water: 0.33 µg/L (2.88 d)<br>Sed./Soil: <0.6 µg/kg   | 98 d LA rice trial 1<br>103 d LA rice trial 2<br>94 d LA rice trial 3<br>113 d LA rice trial 4   | 45344701                                     |
|  | Water: <1 µg/L<br>Sed./Soil: 32 µg/kg (84 d)<br>Water: <1 µg/L<br>Sed./Soil: 7 µg/kg (55 d)<br>Water: <1 µg/L<br>Sed./Soil: 25 µg/kg (258 d)<br>Water: <1 µg/L<br>Sed./Soil: 15 µg/kg (258 d)<br>Water: <1 µg/L<br>Sed./Soil: 10 µg/kg (306 d)<br>Water: <1 µg/L<br>Sed./Soil: 13 µg/kg (127-252 d) | 361 d MS rice seed Trt.<br>361 d MS rice soil Trt.<br>375 d TX rice seed Trt.<br>375 d TX rice soil Trt.<br>376 d CA rice seed Trt.<br>379 d CA rice soil Trt.   | 44443402                                     |
|  | 0.13 µg/L (3 d)<br>0.35 µg/L (1 d)<br>0.22 µg/L (23 d)<br><0.083 µg/L<br>0.12 µg/L (3 d)<br>0.15 µg/L (1 d)   | 118 d LA drill-seeded rice, site 1<br>116 d LA dry-seeded rice, site 1<br>118 d LA pre-sprout rice, site 1<br>111 d LA drill-seeded rice, site 2<br>109 d LA dry-seeded rice, site 2<br>107 d LA pre-sprout rice, site 2 | 46016801                                     |
|  | <i>Long-term soil dissipation studies</i>   |  |  |
|  | 14 µg/kg (85 d, 3 y)<br>12 µg/kg (91 d, 3 y)<br>10 µg/kg (101 d, 3 y)<br>8 µg/kg (190 d, 3 y)<br>10 µg/kg (1 d, 4 y)<br>29 µg/kg (92 d, 2 y)  | 4 y NE Corn PPI<br>4 y IL Corn PPI<br>4 y OH Corn PPI<br>4 y MS Cotton foliar<br>4 y TX Cotton foliar<br>4 y WA Potato foliar  | 46477001                                     |
| <b>Fipronil sulfone<br/>(MB 46136)</b> | <i>Laboratory studies</i>   |  |  |
|  | 9.4% (30 d, Control)<br><b>24.4%</b> (336 d)<br>0.6% (59 d)<br><b>19%</b> (0 d, 0-13 cm soil section)   | Soil photolysis<br>Aerobic soil metabolism<br>Anaerobic aquatic metabolism<br>Un-aged column leaching  | 42918662<br>42918663<br>43291704<br>42918664 |
|  | 54.9% TRR (uptake edible)<br>59.07% TRR (uptake inedible)<br>27.98% TRR (uptake whole fish)<br>47.96% TRR (depuration edible)<br>101.9% TRR (depuration inedible)<br>43.8% TRR (depuration whole)   | Bioaccumulation in Fish  | 43291707                                     |

| Degradate                                 | Maximum % of Applied (µg/L or µg/kg in Field Studies)  | Study Type   | MRID     |
|---|--|--|----------|
|   | <i>Terrestrial field dissipation studies</i>   |  |          |
|   | 7.6 µg/kg (3 m)<br>8.9 µg/kg (2 m)<br>5.4 µg/kg (2 m)<br>6.2 µg/kg (4 m)   | 4-m FL Bare Soil<br>4-m FL Turfed Soil<br>4-m NC Bare Soil<br>4-m NC Turfed Soil   | 43291705 |
|   | 168.2 µg/kg (12 m)<br>168.6 µg/kg (12 m)<br>119.6 µg/kg (8 m)<br>182.5 µg/kg (16 m)  | 18-m CA In furrow corn<br>18-m NE In furrow corn<br>18-m NC In furrow corn<br>18-m WA In furrow corn   | 43401103 |
|   | 50.8 µg/kg (126 d)<br>36.1 µg/kg (7 d)<br>63.1 µg/kg (548 d)   | 490 d CA foliar cotton<br>553 d TX foliar cotton<br>548 d WA foliar potato   | 44262826 |
|   | <i>Aquatic field dissipation studies</i>   |  |          |
|   | Water: 0.81 µg/L (1 d)<br>Sed./Soil: <0.6 µg/kg<br>Water: 0.66 µg/L (1 d)<br>Sed./Soil: <0.6 µg/kg<br>Water: 0.86 µg/L (1 d)<br>Sed./Soil: <0.6 µg/kg<br>Water: 0.57 µg/L (0.5 d)<br>Sed./Soil: 4.3 µg/kg (drain ditch)  | 98 d LA rice trial 1<br><br>103 d LA rice trial 2<br><br>94 d LA rice trial 3<br><br>113 d LA rice trial 4   | 45344701 |
|   | Water: <1 µg/L<br>Sed./Soil: 11 µg/kg (84 d)<br>Water: 1 µg/L (29 d)<br>Sed./Soil: 12 µg/kg (27 d)<br>Water: <1 µg/L<br>Sed./Soil: 14 µg/kg (39 d)<br>Water: <1 µg/L<br>Sed./Soil: 19 µg/kg (39 d)<br>Water: 1 µg/L (0 d)<br>Sed./Soil: <5 µg/kg<br>Water: <1 µg/L<br>Sed./Soil: 9 µg/kg (3 d) | 361 d MS rice seed Trt.<br><br>361 d MS rice soil Trt.<br><br>375 d TX rice seed Trt.<br><br>375 d TX rice soil Trt.<br><br>376 d CA rice seed Trt.<br><br>379 d CA rice soil Trt.                                       | 44443402 |
|   | 0.41 µg/L (3 d)<br>2.14 µg/L (1 d)<br>0.60 µg/L (0 d)<br>1.73 µg/L (66 d)<br>0.74 µg/L (3 d)<br>0.85 µg/L (2 d)  | 118 d LA drill-seeded rice, site 1<br>116 d LA dry-seeded rice, site 1<br>118 d LA pre-sprout rice, site 1<br>111 d LA drill-seeded rice, site 2<br>109 d LA dry-seeded rice, site 2<br>107 d LA pre-sprout rice, site 2 | 46016801 |
|   | <i>Long-term soil dissipation studies</i>  |  |          |
|   | 68 µg/kg (85 d, 3 y)<br>72 µg/kg (91 d, 3 y)<br>48 µg/kg (101 d, 3 y)<br>108 µg/kg (351 d, 2 y)<br>68 µg/kg (3 d, 4 y)<br>138 µg/kg (92 d, 3 y)  | 4 y NE Corn PPI<br>4 y IL Corn PPI<br>4 y OH Corn PPI<br>4 y MS Cotton foliar<br>4 y TX Cotton foliar<br>4 y WA Potato foliar  | 46477001 |
| <b>Fipronil desulfinyl<br/>(MB 46513)</b> | <i>Laboratory studies</i>  |  |          |
|   | 44.4% (6 d)  | Aqueous photolysis   | 42918661 |
|   | 6.9% (30 d)  | Soil photolysis  | 42918662 |
|   | 0.9% (14 d)  | Aerobic soil metabolism  | 42918663 |
|   | 1.0% (59 d)  | Anaerobic aquatic metabolism   | 43291704 |
|   | 1.6% (14 d)  | Aerobic aquatic metabolism   | 44261909 |
|   | <i>Terrestrial field dissipation studies</i>   |  |          |

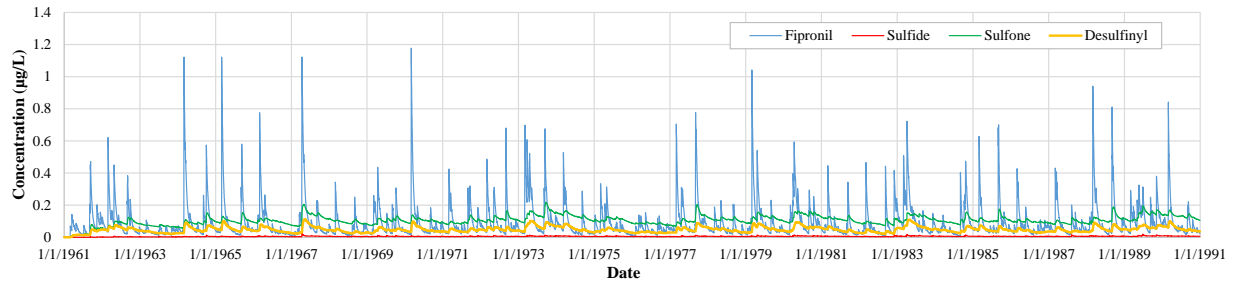
| Degradate                      | Maximum % of Applied (µg/L or µg/kg in Field Studies)  | Study Type   | MRID                             |
|--------------------------------|--|--|----------------------------------|
|                                | 28.5 µg/kg (126 d)<br>12.9 µg/kg (3 d)<br>22.7 µg/kg (183 d)   | 490 d CA foliar cotton<br>553 d TX foliar cotton<br>548 d WA foliar potato   | 44262826                         |
|                                | <i>Aquatic field dissipation studies</i>   |  |                                  |
|                                | Water: 1.9 µg/L (2 d)<br>Sed./Soil: <0.6 µg/kg<br>Water: 1.3 µg/L (1 d)<br>Sed./Soil: <0.6 µg/kg<br>Water: 12.3 µg/L (1 d)<br>Sed./Soil: <0.6 µg/kg<br>Water: 0.39 µg/L (2 d)<br>Sed./Soil: <0.6 µg/kg   | 98 d LA rice trial 1<br>103 d LA rice trial 2<br>94 d LA rice trial 3<br>113 d LA rice trial 4   | 45344701                         |
|                                | Water: <1 µg/L<br>Sed./Soil: <5 µg/kg<br>Water: <1 µg/L<br>Sed./Soil: <5 µg/kg<br>Water: <1 µg/L<br>Sed./Soil: <5 µg/kg<br>Water: <1 µg/L<br>Sed./Soil: <5 µg/kg<br>Water: 3 µg/L (3 d)<br>Sed./Soil: 11 µg/kg (376 d)<br>Water: 2 µg/L (1 d)<br>Sed./Soil: 10 µg/kg (3 d) | 361 d MS rice seed Trt.<br>361 d MS rice soil Trt.<br>375 d TX rice seed Trt.<br>375 d TX rice soil Trt.<br>376 d CA rice seed Trt.<br>379 d CA rice soil Trt.   | 44443402                         |
|                                | 0.88 µg/L (2 d)<br>5.38 µg/L (1 d)<br>3.18 µg/L (2 d)<br>0.20 µg/L (9 d)<br>7.22 µg/L (1 d)<br>6.16 µg/L (1 d)   | 118 d LA drill-seeded rice, site 1<br>116 d LA dry-seeded rice, site 1<br>118 d LA pre-sprout rice, site 1<br>111 d LA drill-seeded rice, site 2<br>109 d LA dry-seeded rice, site 2<br>107 d LA pre-sprout rice, site 2 | 46016801                         |
|                                | <i>Long-term soil dissipation studies</i>  |  |                                  |
|                                | 3 µg/kg (3 d, 3 y)<br><2 µg/kg<br>3 µg/kg (1 d, 4 y)<br>22 µg/kg (3 d, 1 y)<br>14 µg/kg (1 d, 4 y)<br>11 µg/kg (3 d, 3 y)  | 4 y NE Corn PPI<br>4 y IL Corn PPI<br>4 y OH Corn PPI<br>4 y MS Cotton foliar<br>4 y TX Cotton foliar<br>4 y WA Potato foliar  | 46477001                         |
|                                | <i>Laboratory studies</i>  |  |                                  |
|                                | 8.3% (6 d)<br>7.2% (30 d)<br>4% (35 d, 0-14 cm soil section)   | Aqueous photolysis<br>Soil photolysis<br>Aged column leaching  | 42918661<br>42918662<br>42918664 |
|                                | <i>Laboratory studies</i>  |  |                                  |
| RPA 104615                     | 17.6% (368 d)<br>7.7% (365 d)  | ASM of MB 46513<br>Aerobic aquatic metabolism  | 44262830<br>44261909             |
| RPA 105048                     | <i>Laboratory studies</i>  |  |                                  |
| Fipronil amide<br>(RPA 200766) | 54.2% (30 d, pH 9, HPLC)   | Hydrolysis   | 42977905                         |
|                                | 8.6% (30 d)  | Soil photolysis  | 42918662                         |
|                                | 38.3% (336 d)  | Aerobic soil metabolism  | 42918663                         |
|                                | 18.7% (365 d)  | Anaerobic aquatic metabolism   | 43291704                         |
|                                | 11.1% (60 d)   | Aerobic aquatic metabolism   | 44261909                         |
|                                | 26% (35 d, 0-14 cm soil section)   | Aged column leaching   | 42918664                         |
|                                | <i>Terrestrial field dissipation studies</i>   |  |                                  |
|                                | 3.7 µg/kg (3 m)  | 4-m FL Bare Soil   | 43291705                         |

| Degradate                             | Maximum % of Applied (µg/L or µg/kg in Field Studies) | Study Type              | MRID     |
|---------------------------------------|---|-------------------------|----------|
|                                       | 6.2 µg/kg (3 m)                                       | 4-m NC Bare Soil        | 43401103 |
|                                       | 90.1 µg/kg (4 m)                                      | 18-m CA In furrow corn  |          |
|                                       | 109.6 µg/kg (12 m)                                    | 18-m NE In furrow corn  |          |
|                                       | 40.5 µg/kg (4 m)                                      | 18-m NC In furrow corn  |          |
|                                       | 53.5 µg/kg (14 m)                                     | 18-m WA In furrow corn  |          |
|                                       | 14.9 µg/kg (126 d)                                    | 490 d CA foliar cotton  | 44262826 |
|                                       | 11 µg/kg (14 d)                                       | 548 d WA foliar potato  |          |
|                                       | Aquatic field dissipation studies                     |                         |          |
|                                       | Water: <1 µg/L<br>Sed./Soil: <5 µg/kg                 | 361 d MS rice seed Trt. | 44443402 |
|                                       | Water: <1 µg/L<br>Sed./Soil: <5 µg/kg                 | 361 d MS rice soil Trt. |          |
|                                       | Water: <1 µg/L<br>Sed./Soil: 8 µg/kg (47 d)           | 375 d TX rice seed Trt. |          |
|                                       | Water: <1 µg/L<br>Sed./Soil: 16 µg/kg (39 d)          | 375 d TX rice soil Trt. |          |
| Water: <1 µg/L<br>Sed./Soil: <5 µg/kg | 376 d CA rice seed Trt.                               |                         |          |
| Water: <1 µg/L<br>Sed./Soil: <5 µg/kg | 379 d CA rice soil Trt.                               |                         |          |
|                                       |   |                         |          |

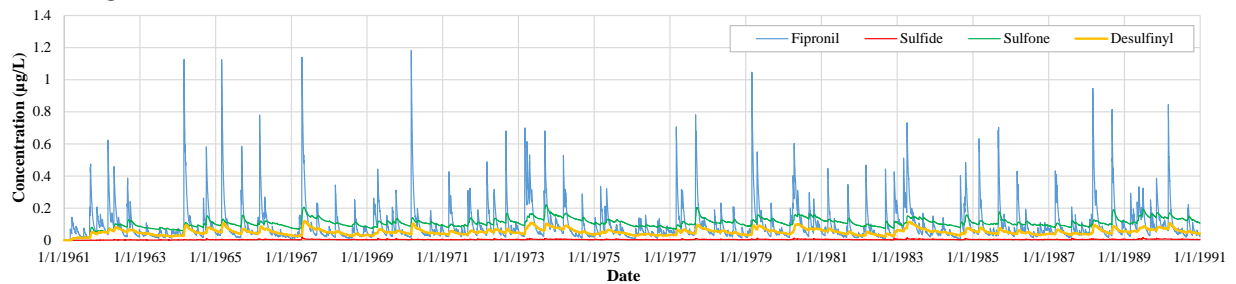
d = days; m = months; Trt. = treatment; TRR = total radioactive residues; ASM = aerobic soil metabolism; PPI = pre-plant incorporated.

**APPENDIX 2. Graphical Presentation of Fipronil ROC EDWCs in Surface Water  
(USEPA Standard Reservoir) from the Scenario that Produced the Highest EDWCs:  
Building perimeter – 3’ up and 10’ out for Control of Tawny Crazy Ant**

*Excluding Unextracted Residues*

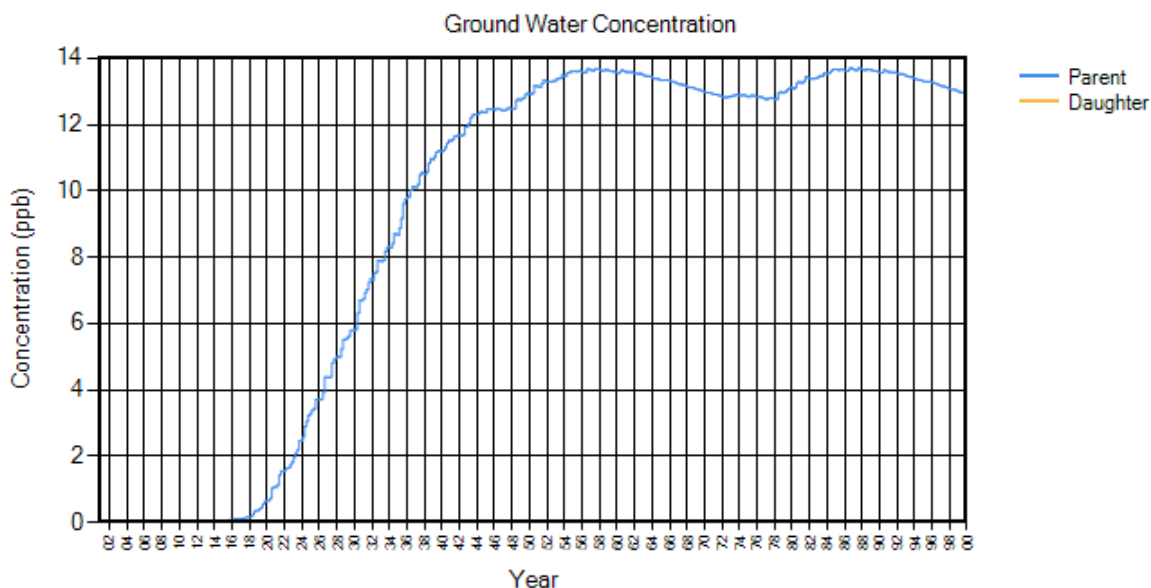


*Including Unextracted Residues*

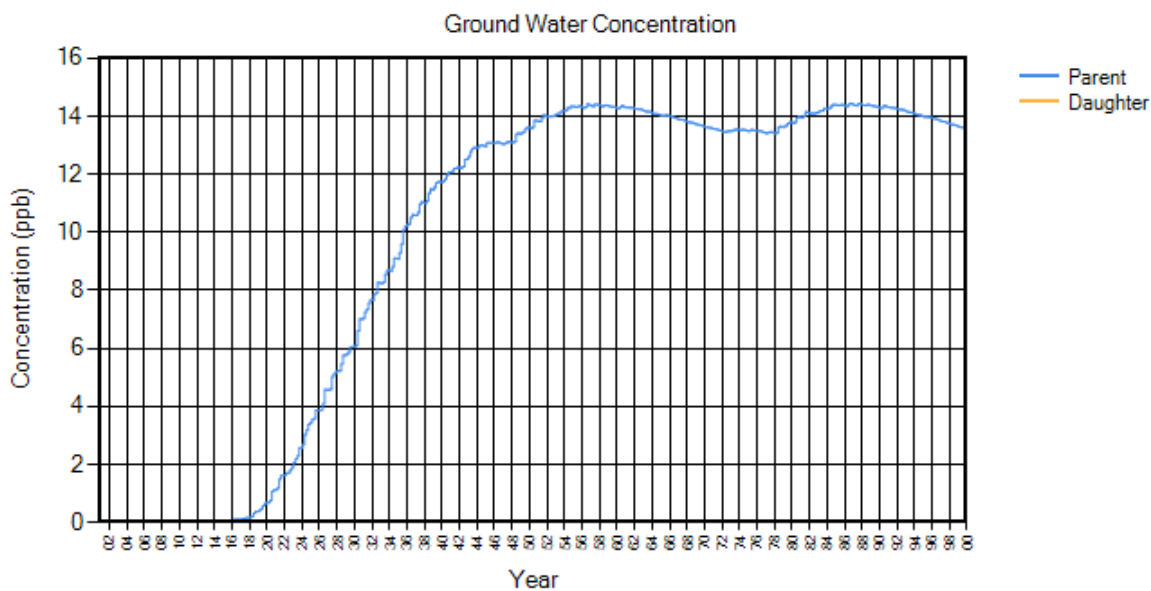


**APPENDIX 3. Graphical Presentation of Fipronil ROCs EDWCs in Groundwater from the Scenario that Produced the Highest EDWCs: Wisconsin Corn (Met File: 14920.dvf)**

*Excluding Unextracted Residues*



*Including Unextracted Residues*



(Neither fipronil sulfide nor sulfone (daughter products) were produced in sufficient quantities in groundwater to appear in the groundwater graphs. Therefore, only fipronil (parent compound) is indicated in the groundwater graphs.)

**Appendix 3 Table 1. Groundwater EDWCs for Fipronil, Fipronil Sulfide, and Fipronil Sulfone based on the Manningtree Soil<sup>A</sup>**

| Crop/Scenario                                 | Parent/<br>Degradate | Highest Daily Value<br>(µg/L) | Post Breakthrough<br>Average (µg/L) | Average Simulation<br>Breakthrough Time<br>(Days) |
|---|----------------------|-------------------------------|-------------------------------------|---|
| <b>Excludes Unextracted Residues</b>          |                      |                               |                                     |   |
| DELMARVA Sweet Corn<br>Met File (13781.dvf)   | Fipronil             | 1.28                          | 1.20                                | 9801  |
|   | Sulfide              | 0.0179                        | NA                                  | NA  |
|   | Sulfone              | 0.0865                        | NA                                  | NA  |
| Florida Citrus<br>Met File (12842.dvf)        | Fipronil             | 1.51                          | 1.42                                | 8006  |
|   | Sulfide              | <b>0.0500</b>                 | NA                                  | NA  |
|   | Sulfone              | <b>0.256</b>                  | NA                                  | NA  |
| Florida Potato<br>Met File (13889.dvf)        | Fipronil             | 0.0209                        | 0.0167                              | 13,732  |
|   | Sulfide              | 0.000622                      | NA                                  | NA  |
|   | Sulfone              | 0.00463                       | NA                                  | NA  |
| Georgia Peanuts<br>Met File (w93805.dvf)      | Fipronil             | 0.358                         | 0.337                               | 12,294  |
|   | Sulfide              | 0.000605                      | NA                                  | NA  |
|   | Sulfone              | 0.00185                       | NA                                  | NA  |
| North Carolina Cotton<br>Met File (13722.dvf) | Fipronil             | 0.842                         | 0.736                               | 8822  |
|   | Sulfide              | 0.0251                        | NA                                  | NA  |
|   | Sulfone              | 0.0999                        | NA                                  | NA  |
| Wisconsin Corn<br>Met File (14920.dvf)        | Fipronil             | <b>3.78</b>                   | <b>3.61</b>                         | 11,766  |
|   | Sulfide              | 0.0231                        | NA                                  | NA  |
|   | Sulfone              | 0.0666                        | NA                                  | NA  |
| <b>Includes Unextracted Residues</b>          |                      |                               |                                     |   |
| DELMARVA Sweet Corn<br>Met File (13781.dvf)   | Fipronil             | 1.94                          | 1.83                                | 9801  |
|   | Sulfide              | 0.0356                        | NA                                  | NA  |
|   | Sulfone              | 0.132                         | NA                                  | NA  |
| Florida Citrus<br>Met File (12842.dvf)        | Fipronil             | 2.15                          | 2.01                                | 8006  |
|   | Sulfide              | <b>0.0929</b>                 | NA                                  | NA  |
|   | Sulfone              | <b>0.374</b>                  | NA                                  | NA  |
| Florida Potato<br>Met File (13889.dvf)        | Fipronil             | 0.0409                        | 0.0335                              | 13,732  |
|   | Sulfide              | 0.00172                       | NA                                  | NA  |
|   | Sulfone              | 0.00887                       | NA                                  | NA  |
| Georgia Peanuts<br>Met File (w93805.dvf)      | Fipronil             | 0.565                         | 0.534                               | 12,294  |
|   | Sulfide              | 0.00122                       | NA                                  | NA  |
|   | Sulfone              | 0.00289                       | NA                                  | NA  |
| North Carolina Cotton<br>Met File (13722.dvf) | Fipronil             | 1.35                          | 1.19                                | 8822  |
|   | Sulfide              | 0.0544                        | NA                                  | NA  |
|   | Sulfone              | 0.159                         | NA                                  | NA  |
| Wisconsin Corn<br>Met File (14920.dvf)        | Fipronil             | <b>5.14</b>                   | <b>4.92</b>                         | 11,766  |
|   | Sulfide              | 0.0382                        | NA                                  | NA  |
|   | Sulfone              | 0.0934                        | NA                                  | NA  |

<sup>A</sup> Maximum values are in bold.

**Appendix 3 Table 2. Groundwater EDWCs for Fipronil, Fipronil Sulfide, and Fipronil Sulfone based on the Speyer Soil<sup>A</sup>**

| Crop/Scenario                               | Parent/<br>Degradate | Highest Daily Value<br>(µg/L) | Post Breakthrough<br>Average (µg/L) | Average Simulation<br>Breakthrough Time<br>(Days) |
|---|----------------------|-------------------------------|-------------------------------------|---|
| <b>Excludes Unextracted Residues</b>        |                      |                               |                                     |   |
| DELMARVA Sweet Corn<br>Met File (13781.dvf) | Fipronil             | 4.73                          | 4.47                                | 9801  |
|   | Sulfide              | 0.0119                        | NA                                  | NA  |
|   | Sulfone              | 0.0433                        | NA                                  | NA  |

| Crop/Scenario                                 | Parent/<br>Degradate           | Highest Daily Value<br>(µg/L)         | Post Breakthrough<br>Average (µg/L) | Average Simulation<br>Breakthrough Time<br>(Days) |
|---|--------------------------------|---------------------------------------|-------------------------------------|---|
| Florida Citrus<br>Met File (12842.dvf)        | Fipronil<br>Sulfide<br>Sulfone | 4.57<br><b>0.0266</b><br><b>0.106</b> | 4.24<br>NA<br>NA                    | 8006<br>NA<br>NA                                  |
| Florida Potato<br>Met File (13889.dvf)        | Fipronil<br>Sulfide<br>Sulfone | 0.194<br>0.00104<br>0.00467           | 0.169<br>NA<br>NA                   | 13,732<br>NA<br>NA                                |
| Georgia Peanuts<br>Met File (w93805.dvf)      | Fipronil<br>Sulfide<br>Sulfone | 1.46<br>0.000449<br>0.00104           | 1.40<br>NA<br>NA                    | 12,294<br>NA<br>NA                                |
| North Carolina Cotton<br>Met File (13722.dvf) | Fipronil<br>Sulfide<br>Sulfone | 3.70<br>0.0187<br>0.0523              | 3.30<br>NA<br>NA                    | 8822<br>NA<br>NA                                  |
| Wisconsin Corn<br>Met File (14920.dvf)        | Fipronil<br>Sulfide<br>Sulfone | <b>9.66</b><br>0.0117<br>0.0303       | <b>9.14</b><br>NA<br>NA             | 11,766<br>NA<br>NA                                |
| <b>Includes Unextracted Residues</b>          |                                |                                       |                                     |   |
| DELMARVA Sweet Corn<br>Met File (13781.dvf)   | Fipronil<br>Sulfide<br>Sulfone | 5.51<br>0.0187<br>0.0656              | 5.21<br>NA<br>NA                    | 9801<br>NA<br>NA                                  |
| Florida Citrus<br>Met File (12842.dvf)        | Fipronil<br>Sulfide<br>Sulfone | 5.22<br><b>0.0418</b><br><b>0.160</b> | 4.84<br>NA<br>NA                    | 8006<br>NA<br>NA                                  |
| Florida Potato<br>Met File (13889.dvf)        | Fipronil<br>Sulfide<br>Sulfone | 0.261<br>0.00194<br>0.00841           | 0.230<br>NA<br>NA                   | 13,732<br>NA<br>NA                                |
| Georgia Peanuts<br>Met File (w93805.dvf)      | Fipronil<br>Sulfide<br>Sulfone | 1.72<br>0.000697<br>0.00155           | 1.64<br>NA<br>NA                    | 12,294<br>NA<br>NA                                |
| North Carolina Cotton<br>Met File (13722.dvf) | Fipronil<br>Sulfide<br>Sulfone | 4.42<br>0.0308<br>0.0823              | 3.95<br>NA<br>NA                    | 8822<br>NA<br>NA                                  |
| Wisconsin Corn<br>Met File (14920.dvf)        | Fipronil<br>Sulfide<br>Sulfone | <b>10.7</b><br>0.0170<br>0.0423       | <b>10.1</b><br>NA<br>NA             | 11,766<br>NA<br>NA                                |

<sup>A</sup> Maximum values are in bold.

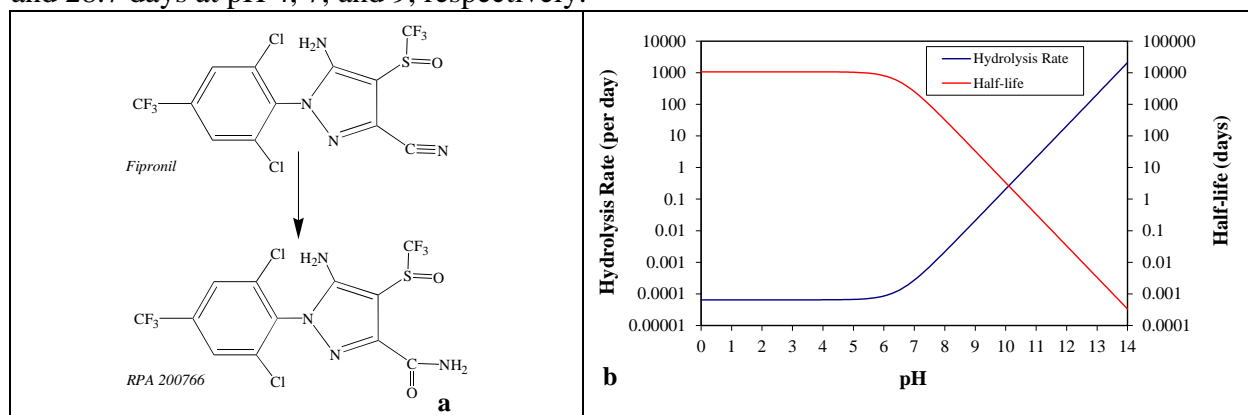
## APPENDIX 4. Derivation of the Formation/Decline (FD) Model Input Parameters

Currently, there is no official guidance for conducting an exposure assessment using the formation and decline (FD) approach to estimate model input parameters. The methods used below are an attempt to perform such an analysis, but should not be interpreted as setting any precedent that future assessments would need to follow. As more assessments are performed with this approach, EPA will gain experience and be in a better position to develop formal guidance for the FD approach to exposure assessment.

### Abiotic Hydrolysis

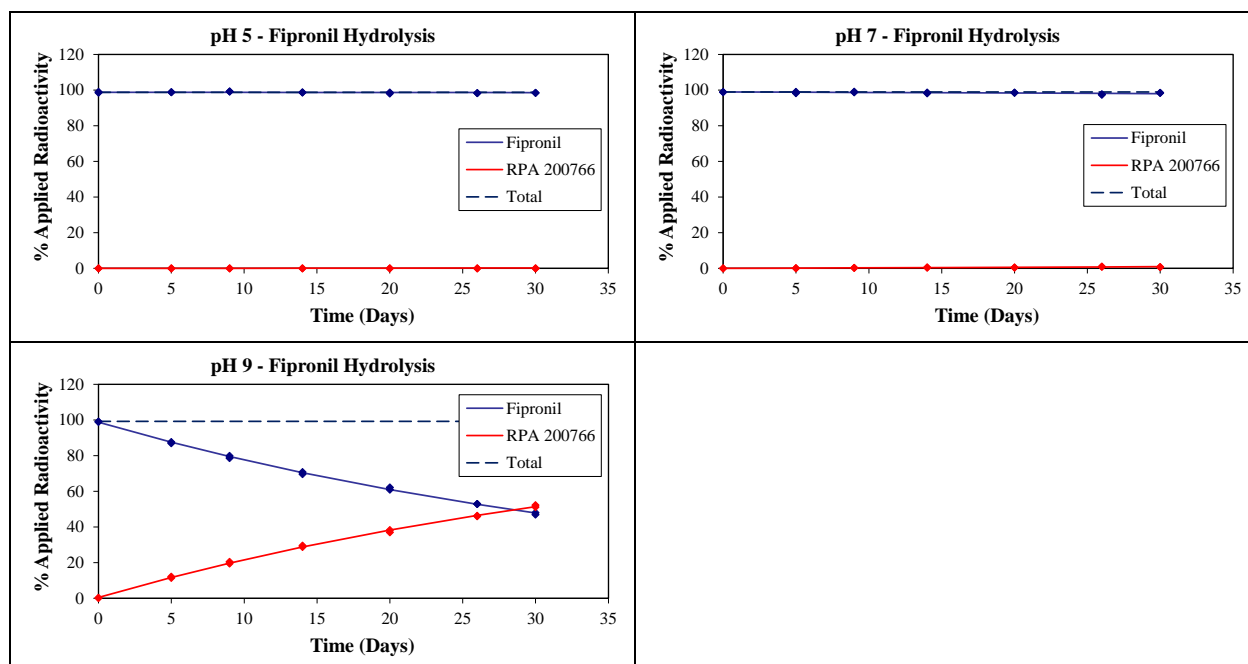
#### *Fipronil*

In MRID 42977905, the abiotic hydrolysis of fipronil occurred via a single reaction. This study measured both fipronil decline and degradate formation at pH 5, 7, and 9 and 25°C for 30 days using a single radiolabel. In this hydrolysis reaction, fipronil converts to its amide, RPA 200766 (Appendix 4 Figure 1a). The speed of this reaction varied with pH via acid-catalyzed and base-catalyzed hydrolysis (Appendix 4 Figure 1b). The half-lives of fipronil at 25°C are 10,322, 2140, and 28.7 days at pH 4, 7, and 9, respectively.



**Appendix 4 Figure 1. Fipronil abiotic hydrolysis pathway (a) and variation in reaction rate and half-life across pH (b).**

The quality of the fit between the modeled reaction kinetic predictions and the experimental observations is depicted in the three graphs (one for each pH) of Appendix 4 Figure 2.

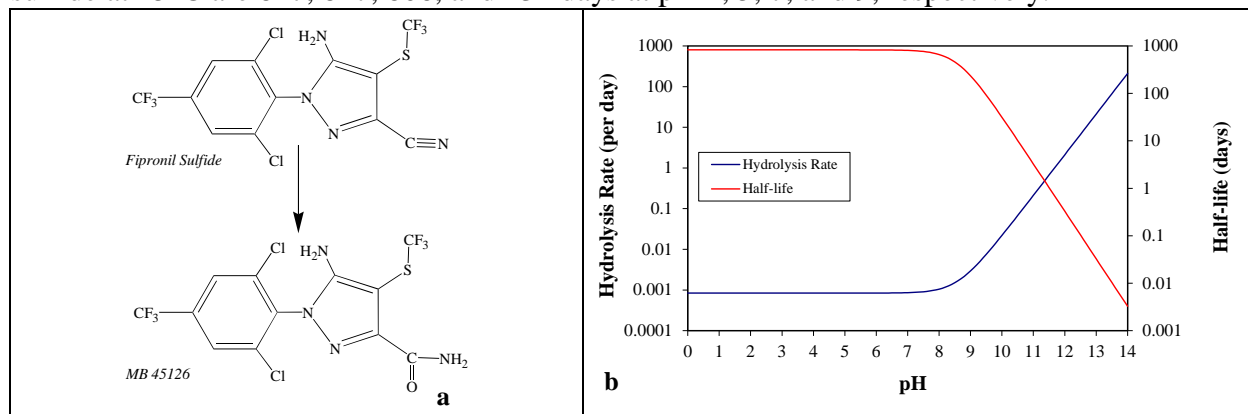


**Appendix 4 Figure 2.** Comparison of modeled fipronil abiotic hydrolysis reaction kinetics (curves) to experimental observations (dots) for pH 5, 7, and 9 at 25°C.

The pH 7 half-life of 2140 days is used in ground water modeling. For surface water modeling, the same half-life could be used. Theoretically though, abiotic hydrolysis is already accounted for in the aerobic and anaerobic aquatic metabolism half-lives. Rather than correct the aquatic metabolism half-lives, the aquatic metabolism half-lives were left uncorrected and hydrolysis was modeled as stable.

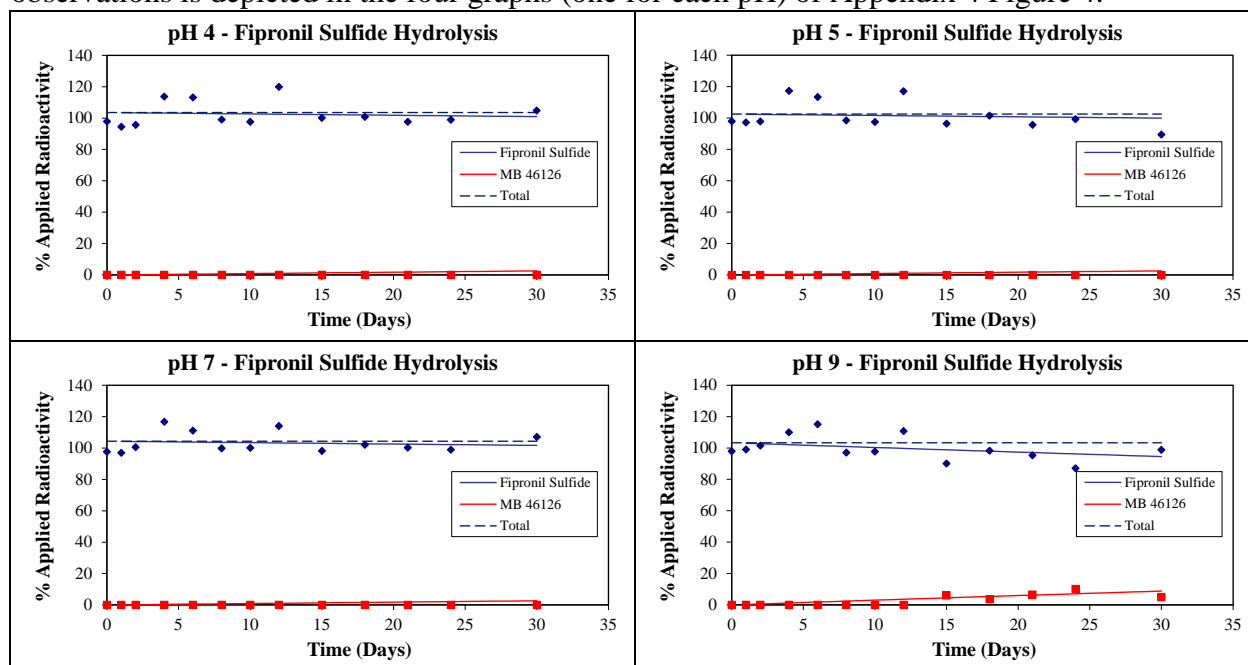
#### *Fipronil Sulfide*

In MRID 49151509, the abiotic hydrolysis of fipronil sulfide occurred via a single reaction. This study measured both parent compound decline and degradate formation at pH 4, 5, 7, and 9 and 25°C for 30 days using a single radiolabel. In this hydrolysis reaction, fipronil sulfide converts to fipronil amide, RPA 200766 (Appendix 4 Figure 3a). The speed of this reaction varied with pH via base-catalyzed and neutral hydrolysis (Appendix 4 Figure 3b). The half-lives of fipronil sulfide at 25°C are 827, 827, 806, and 234 days at pH 4, 5, 7, and 9, respectively.



**Appendix 4 Figure 3.** Fipronil sulfide abiotic hydrolysis pathway (a) and variation in reaction rate and half-life across pH (b).

The quality of the fit between the modeled reaction kinetic predictions and the experimental observations is depicted in the four graphs (one for each pH) of Appendix 4 Figure 4.

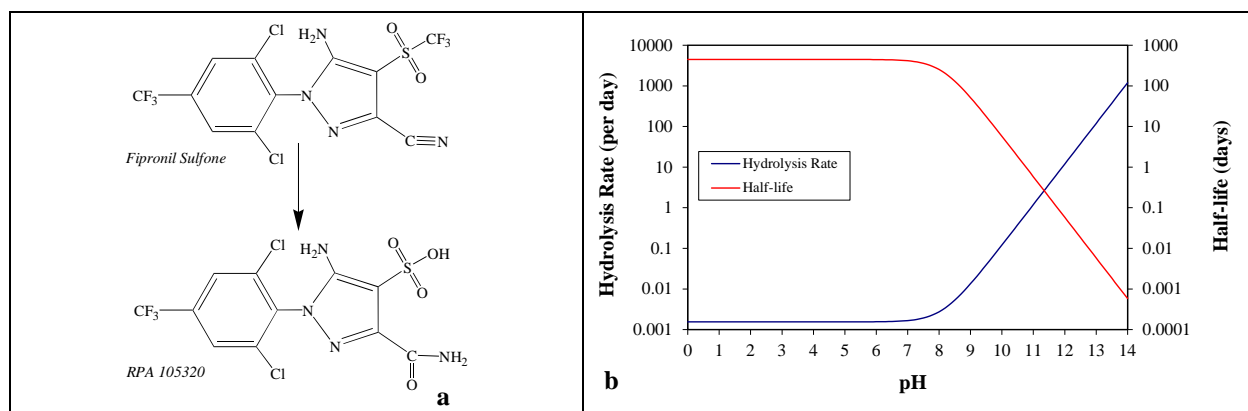


**Appendix 4 Figure 4.** Comparison of modeled fipronil sulfide abiotic hydrolysis reaction kinetics (curves) to experimental observations (dots) for pH 4, 5, 7, and 9 at 25°C.

The pH 7 half-life of 806 days is used in ground water modeling. For surface water modeling, the same half-life could be used. Theoretically though, abiotic hydrolysis is already accounted for in the aerobic and anaerobic aquatic metabolism half-lives. Rather than correct the aquatic metabolism half-lives, the aquatic metabolism half-lives were left uncorrected and hydrolysis was modeled as stable. Because fipronil sulfide is not formed from the abiotic hydrolysis of fipronil, the hydrolysis formation fraction (FF) is zero.

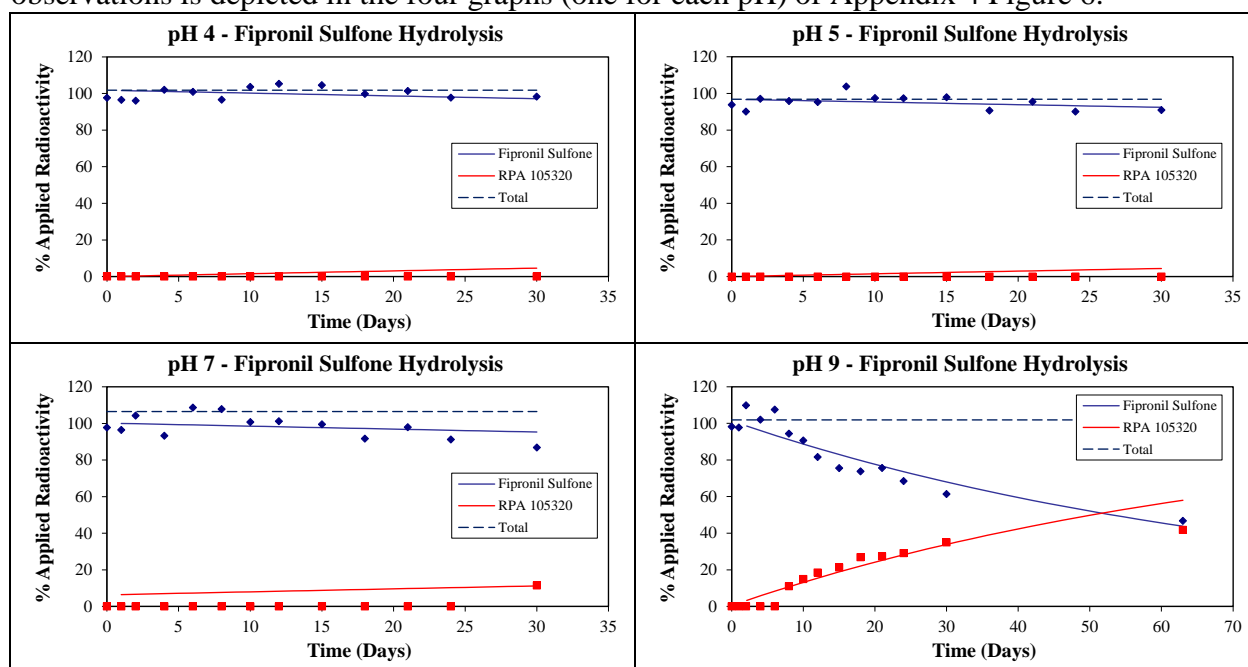
#### *Fipronil Sulfone*

In MRID 49151510, the abiotic hydrolysis of fipronil sulfone occurred via a single reaction. This study measured both parent compound decline and degradate formation at pH 4, 5, and 7 and 25°C for 30 days and 63 days for pH 9 using a single radiolabel. In this hydrolysis reaction, fipronil sulfone converts to RPA 105320 (Appendix 4 Figure 5a). The speed of this reaction varied with pH via base-catalyzed and neutral hydrolysis (Appendix 4 Figure 5b). The half-lives of fipronil sulfone at 25°C are 448, 447, 416, and 52.1 days at pH 4, 5, 7, and 9, respectively.



**Appendix 4 Figure 5.** Fipronil sulfone abiotic hydrolysis pathway (a) and variation in reaction rate and half-life across pH (b).

The quality of the fit between the modeled reaction kinetic predictions and the experimental observations is depicted in the four graphs (one for each pH) of Appendix 4 Figure 6.



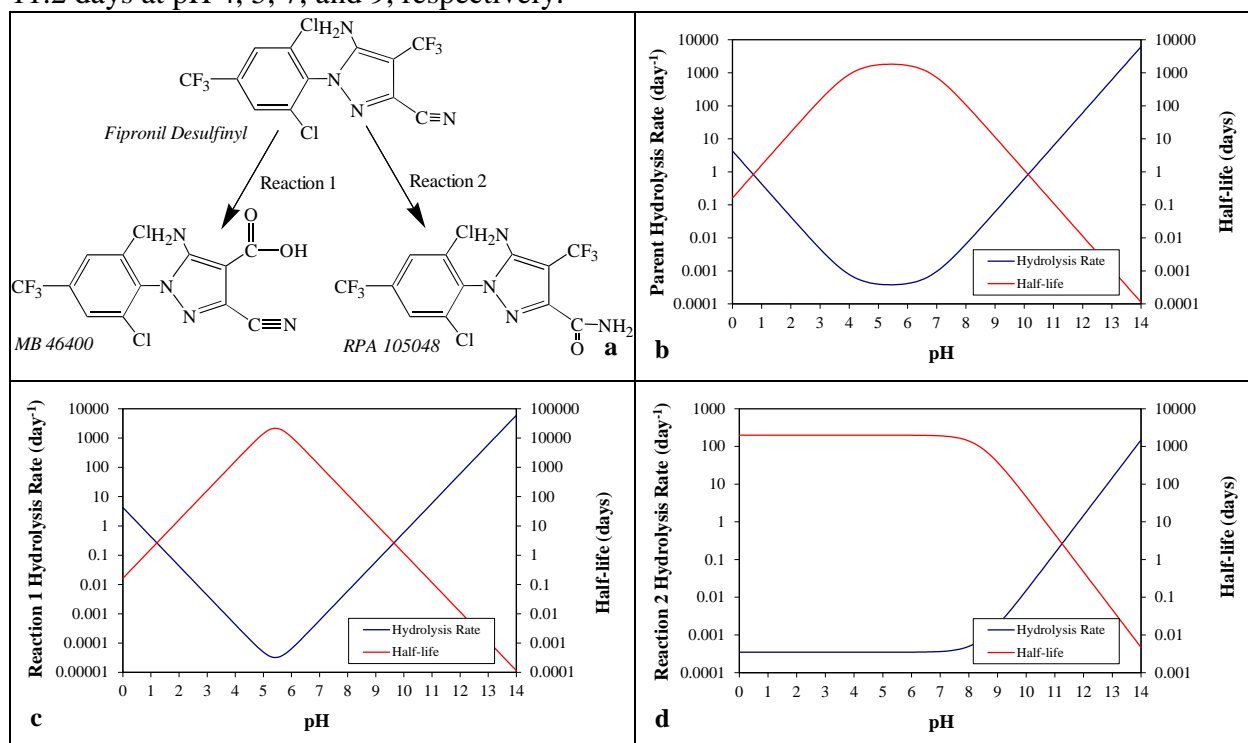
**Appendix 4 Figure 6.** Comparison of modeled fipronil sulfone abiotic hydrolysis reaction kinetics (curves) to experimental observations (dots) for pH 4, 5, 7, and 9 at 25°C.

The pH 7 half-life of 416 days is used in ground water modeling. For surface water modeling, the same half-life could be used. Theoretically though, abiotic hydrolysis is already accounted for in the aerobic and anaerobic aquatic metabolism half-lives. Rather than correct the aquatic metabolism half-lives, the aquatic metabolism half-lives were left uncorrected and hydrolysis was modeled as stable. Because fipronil sulfone is not formed from the abiotic hydrolysis of fipronil, the hydrolysis formation fraction (FF) is zero.

#### *Fipronil Desulfinyl*

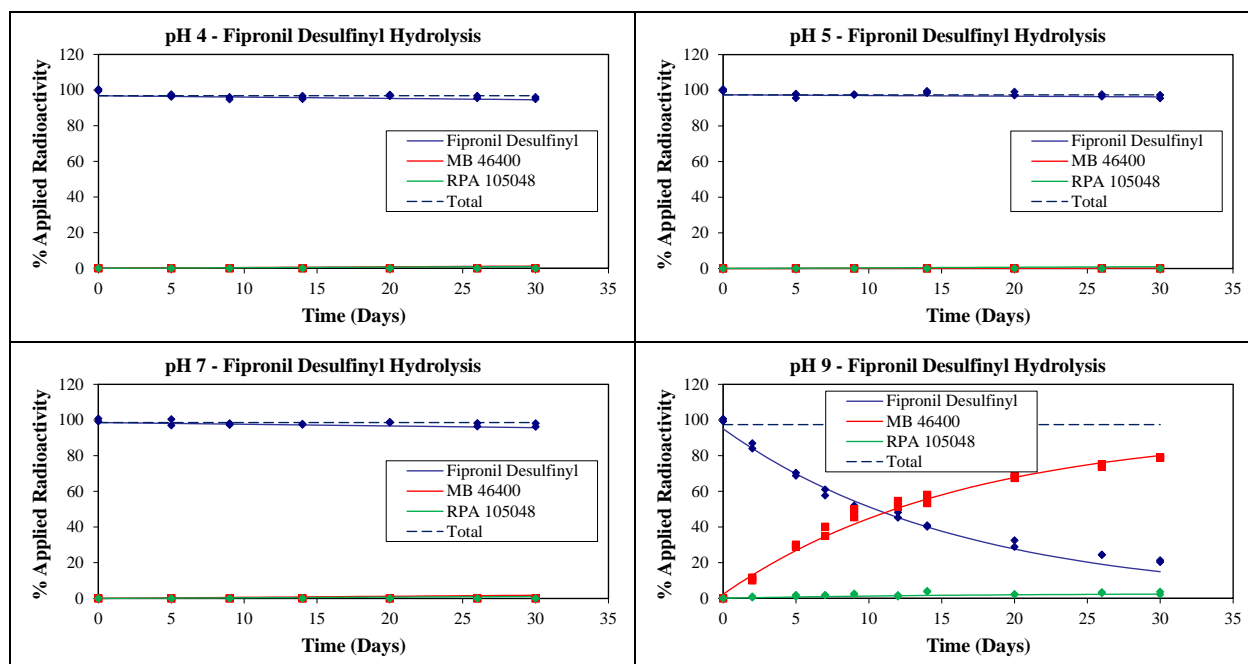
In MRID 49151510, the abiotic hydrolysis of fipronil desulfinyl occurred via two reactions in parallel. This study measured both parent compound decline and formation of degradates at pH 4, 5, 7, and 9 and 25°C for 30 days using a single radiolabel. In reaction 1, the cyano group of

fipronil desulfinyl is altered to form MB 46400 (Appendix 4 Figure 7a). The speed of reaction 1 varied with pH via acid- and base-catalyzed and neutral hydrolysis (Appendix 4 Figure 7c). In reaction 2, one of the trifluoromethyl groups of fipronil desulfinyl is converted to a carboxylic acid group to form RPA 105048 (Appendix 4 Figure 7a). The speed of reaction 2 varied with pH via base-catalyzed and neutral hydrolysis (Appendix 4 Figure 7d). The degradation of the parent molecule is a function has of both reactions occurring simultaneously, and therefore has a different relationship between reaction rate and pH from either of the daughter products (Appendix 4 Figure 7b). The half-lives of fipronil desulfinyl at 25°C are 890, 1744, 720, and 11.2 days at pH 4, 5, 7, and 9, respectively.



**Appendix 4 Figure 7. Fipronil desulfinyl abiotic hydrolysis pathway (a) and variation in parent decline rate (b) and metabolite formation rate across pH for via reaction 1 (c) and reaction 2 (d).**

The quality of the fit between the modeled reaction kinetic predictions and the experimental observations is depicted in the four graphs (one for each pH) of Appendix 4 Figure 8. Note that the observed degradate concentrations for all time points sampled at pH 4, 5, and 7 were below the method detection limit. Only at pH 9 is there good evidence that fipronil desulfinyl is degrading (21 %AR remaining at 30 days) and MB 46400 is formed (79 %AR at 30 days). RPA 105048 is also only observed at pH 9, but never exceeds 4.1 %AR. These data indicate with certainty that fipronil desulfinyl degrades via base-catalyzed hydrolysis to MB 46400 (predominantly) and RPA 105048 in the basic range of the pH scale and degrades to a much more limited extent under acidic conditions.



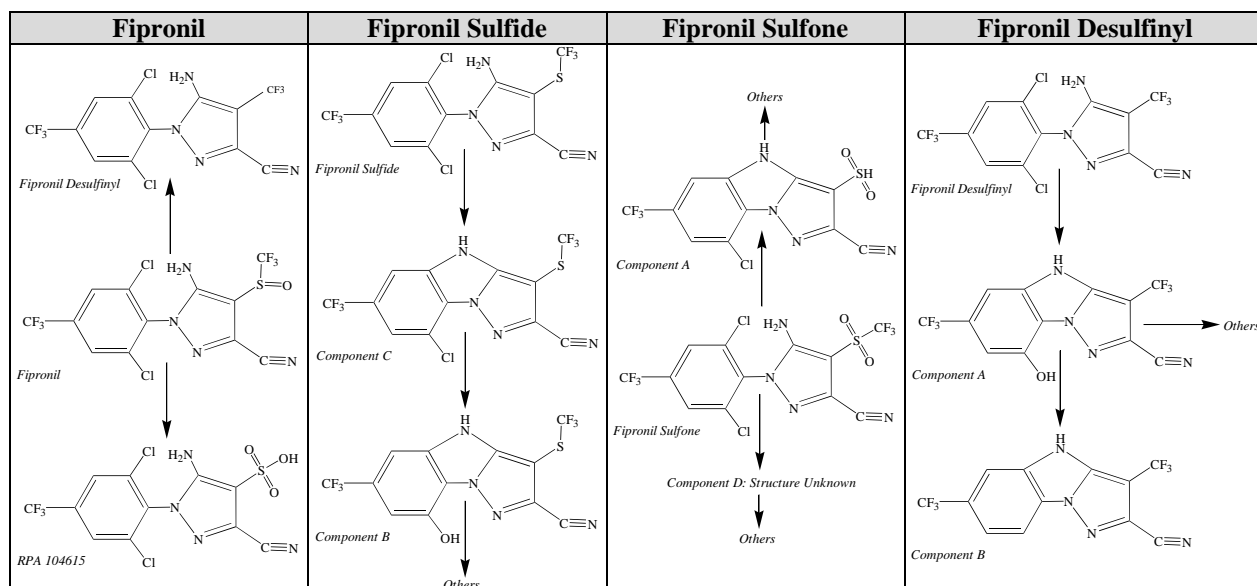
**Appendix 4 Figure 8. Comparison of modeled fipronil desulfinyl abiotic hydrolysis reaction kinetics (curves) to experimental observations (dots) for pH 4, 5, 7, and 9 at 25°C.**

The modeled hydrolysis under acidic conditions is highly uncertain (Appendix 4 Figure 7b, c, and d) since it is only fitted from small changes in the fipronil desulfinyl measured (neither degrade exceeded the detection limit under neutral or acidic conditions).

The pH 7 half-life of 720 days is used in ground water modeling. For surface water modeling, the same half-life could be used. Theoretically though, abiotic hydrolysis is already accounted for in the aerobic and anaerobic aquatic metabolism half-lives. Rather than correct the aquatic metabolism half-lives, the aquatic metabolism half-lives were left uncorrected and hydrolysis was modeled as stable. Because fipronil desulfinyl is not formed from the abiotic hydrolysis of fipronil, the hydrolysis formation fraction (FF) is zero.

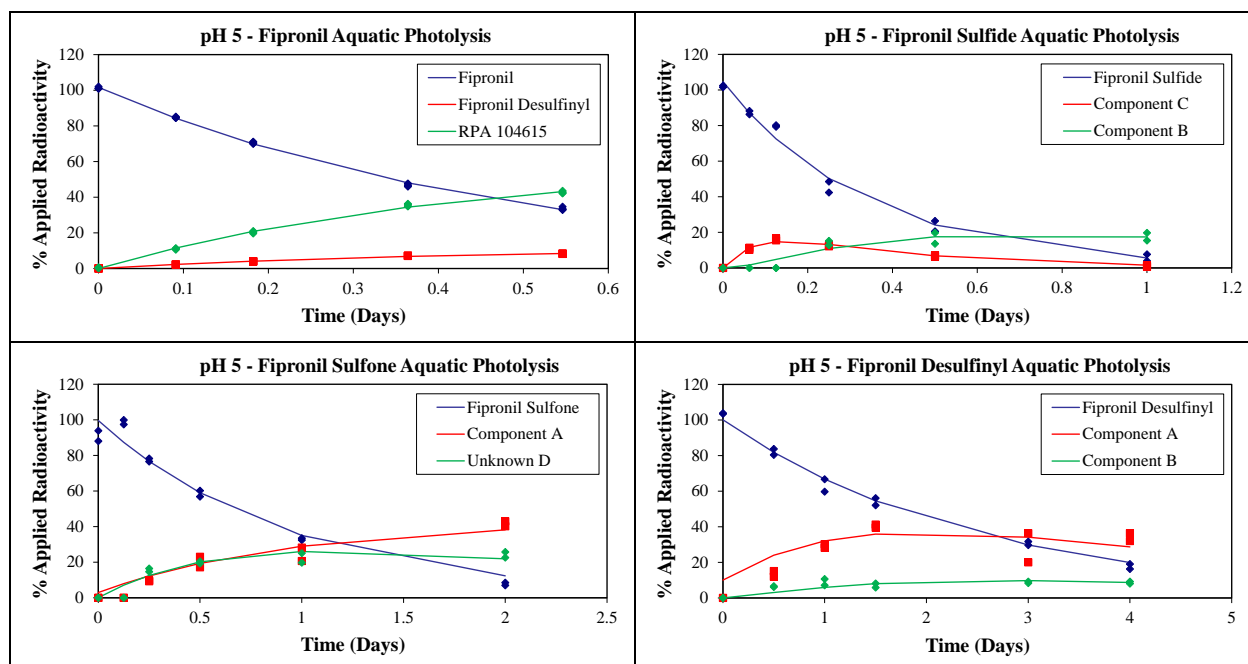
#### Aquatic Photolysis

Aquatic photolysis data is provided in MRIDs 42918661 (fipronil), 49151512 (sulfide), 49151513 (sulfone), and 49151514 (desulfinyl) and measured at 25°C for all of the fipronil ROCs. Aquatic photolysis was measured for all ROCs at pH 5, presumably because the fipronil ROCs degrade (for the most part) via base-catalyzed hydrolysis. The aquatic photolysis degradation pathways for the fipronil ROCs are depicted in Appendix 4 Figure 9. Note that the unknown degradates are referred to as “component A”, “component B”, etc. in the sulfide, sulfone, and desulfinyl studies, but that these degradate names do not refer to the same chemical in different studies (*i.e.*, the component B in the sulfide study is a different chemical than the component B in the desulfinyl study).



**Appendix 4 Figure 9. Aquatic photolysis pathways for fipronil and its degradates.**

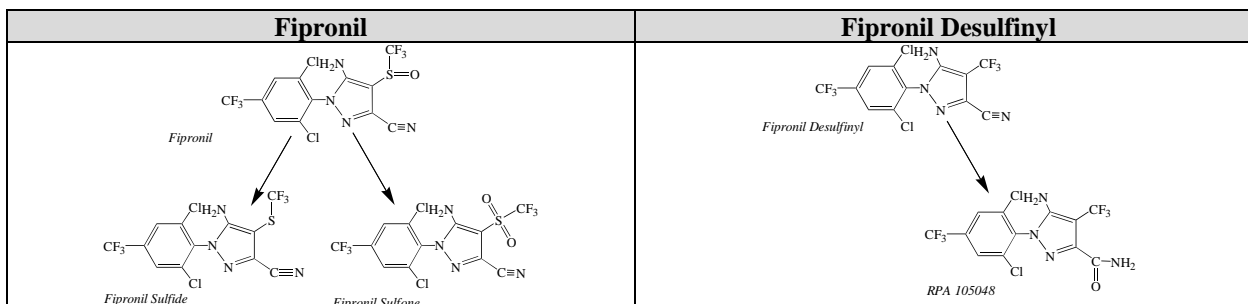
The quality of the fit between the modeled reaction kinetic predictions and the experimental observations is depicted in the four graphs (one for each ROC) of Appendix 4 Figure 10. The aquatic photolysis half-lives of fipronil, sulfide, sulfone, and desulfinyl are 0.34, 0.24, 0.66, and 1.71 days, respectively. However, fipronil sulfide, sulfone, and desulfinyl degrade photolytically into chemicals with intact cyano groups similar to the fipronil ROCs. Because these chemicals may be additional ROCs, fipronil sulfide, sulfone, and desulfinyl were conservatively modeled as stable to aquatic photolysis. Two half-life estimates were available for desulfinyl, 1.71 days from MRID 49151514 and 3.71 days from MRID 42918661. The 3.71 day half-life was used to be conservative and to be consistent with the study that yielded the fipronil half-life estimate and the 0.667 FF for conversion of fipronil into the desulfinyl photodegradate. Because neither fipronil sulfide nor sulfone are photodegradates of fipronil, both have a FF of zero.



Appendix 4 Figure 10. Modeled fipronil, sulfide, sulfone, and desulfinyl aquatic photolysis reaction kinetics (curves) to experimental observations (dots) for pH 5 at 25°C.

### Aerobic Soil Metabolism

Two aerobic soil metabolism studies are available for fipronil ROCs. MRID 42918663 contains fipronil aerobic soil metabolism data on two soils with both indicating the fipronil degradation pathway in Appendix 4 Figure 11, whereas MRID 44262830 contains desulfinyl aerobic soil metabolism data also on two soils. In MRID 42918663, fipronil treated soil was extracted with acetonitrile only and produced maximum unextracted residue values of 16% in Manningtree soil and 6.5% in Speyer 2.2 soil. In MRID 44262830, desulfinyl treated soil was extracted three times with acetonitrile:water (80:20). A fourth extraction was carried out using acetonitrile:water:phosphoric acid (80:18:2) to release further activity but only on days 256 and 368 for loamy sand soil 1 and only day 368 for loamy sand soil 2. Maximum unextracted residue are 10% in loamy sand soil 1 and 8% in loamy sand soil 2.

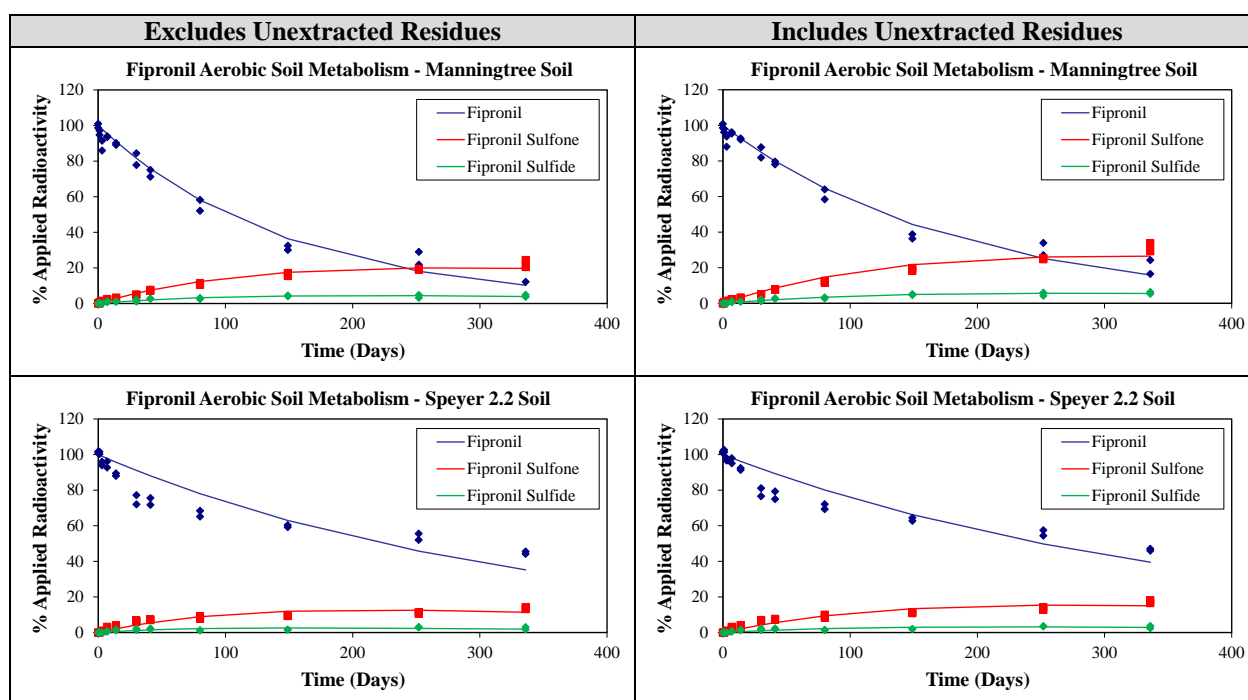


Appendix 4 Figure 11. Aerobic soil metabolism pathways for fipronil and fipronil desulfinyl.

### *Fipronil*

The quality of the fit between the modeled reaction kinetic predictions and the experimental observations is depicted in Appendix 4 Figure 12 for the fipronil soils. This figure contains four

graphs. The two on the left are for two soils and exclude unextracted residues from the temporal trends indicated. The two on the right are for the same two soils, but have their trends augmented to account for the unextracted residues measured as if they were composed of the ROCs measured in the study (the unextracted residues are proportionally divided between the ROCs based on the relative proportions of the ROCs measured at each time point during the study). Therefore, the aquatic aerobic soil metabolism half-life of fipronil in the Manningtree soil is 102 days if unextracted residues are excluded or 127 days if unextracted residues are included. This provides high and low estimates that should bracket the ‘true’ half-life. Similarly for the Speyer 2.2 soil, the half-life of fipronil is 223 days if unextracted residues are excluded or 251 days if unextracted residues are included. Taking the 90<sup>th</sup> percentile on the mean estimate, yields half-life model inputs for fipronil of 349 days if unextracted residues are excluded and 379 days if unextracted residues are included.



**Appendix 4 Figure 12.** Comparison of modeled fipronil aerobic soil metabolism reaction kinetics (curves) to experimental observations (dots) at 25°C for two soils excluding and including unextracted residues.

This study also provides half-life and FF estimates for fipronil sulfide and sulfone. The sulfide half-life estimate for the Manningtree soil is 212 days with a FF of 0.865 if unextracted residues are excluded or 4088 days with a FF of 0.929 if unextracted residues are included. The sulfide half-life estimate for the Speyer 2.2 soil is 2099 days with a FF of 0.087 if unextracted residues are excluded or 286 days with an FF of 0.109 if unextracted residues are included. Taking the 90<sup>th</sup> percentile on the mean estimate, yields half-life model inputs for fipronil of 371 days with a FF of 0.237 if unextracted residues are excluded and 482 days with a FF of 0.192 if unextracted residues are included.

The sulfone half-life estimate for the Manningtree soil is 416 days<sup>2</sup> with a FF of 0.316 if unextracted residues are excluded or 416 days<sup>1</sup> with a FF of 0.448 if unextracted residues are included. The sulfone half-life estimate for the Speyer 2.2 soil is 105 days with a FF of 0.526 if unextracted residues are excluded or 142 days with an FF of 0.576 if unextracted residues are included. Taking the 90<sup>th</sup> percentile on the mean estimate, yields half-life model inputs for fipronil of 416 days<sup>3</sup> with a FF of 0.743 if unextracted residues are excluded and 416 days with a FF of 0.709 if unextracted residues are included.

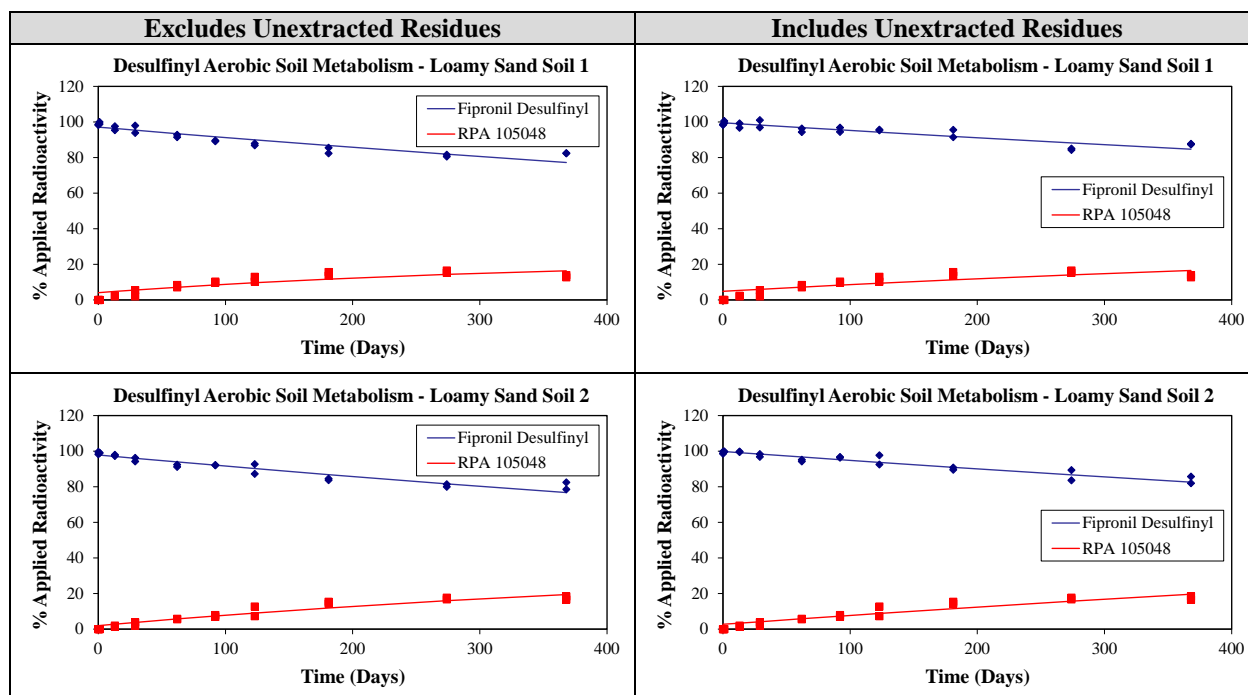
#### *Fipronil Desulfinyl*

The quality of the fit between the modeled reaction kinetic predictions and the experimental observations is depicted in Appendix 4 Figure 13. The aerobic soil metabolism half-life of desulfinyl in the loamy sand soil 1 is 1114 days if unextracted residues are excluded or 1577 days if unextracted residues are included. The aerobic soil metabolism half-life of desulfinyl in the loamy soil 2 is 1048 days if unextracted residues are excluded or 1345 days if unextracted residues are included. Taking the 90<sup>th</sup> percentile on the mean estimate, yields half-life model inputs for fipronil of 1183 days if unextracted residues are excluded and 1818 days if unextracted residues are included. However under current Agency models, the desulfinyl photodegradate is only formed in the water; therefore, the desulfinyl aerobic soil metabolism half-life has no effect on the calculations of exposure and risk.

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<sup>2</sup> The first fit of the Manningtree data both with unextracted residues excluded and included indicated a sulfone aerobic soil metabolism half-life that was longer than sulfone hydrolysis half-life of 416 days. Since the soils are moist throughout experiment, a fit was tried in which the sulfone aerobic soil metabolism half-life was forced to be less than or equal to the sulfone hydrolysis half-life. This fit (shown in Appendix 4 Figure 12) was deemed acceptable and was used in the assessment.

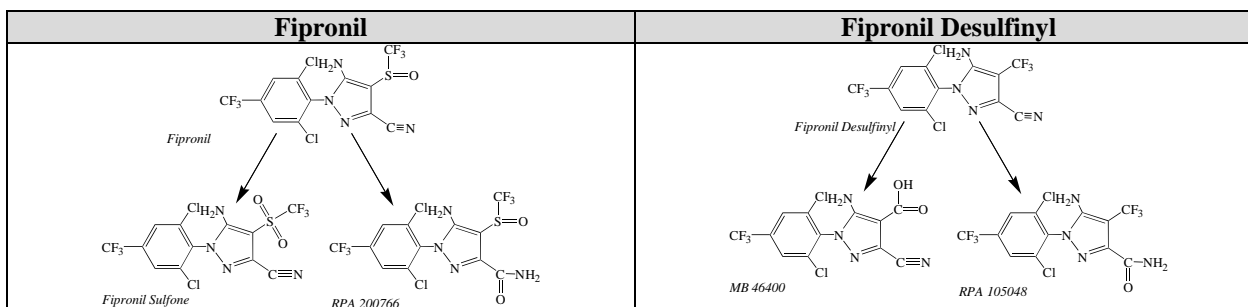
<sup>3</sup> Taking the 90<sup>th</sup> percentile of the mean estimate, yields half-life model inputs for fipronil of 740 days if unextracted residues are excluded and 702 days. However, since these values are again slower than the hydrolysis half-life estimate, the hydrolysis half-life was used as the sulfone aerobic soil metabolism half-life in the assessment.



**Appendix 4 Figure 13.** Comparison of modeled fipronil desulfinyl aerobic soil metabolism reaction kinetics (curves) to experimental observations (dots) at 25°C for two soils excluding and including unextracted residues.

### Aerobic Aquatic Metabolism

Three aerobic aquatic metabolism studies are available for fipronil ROCs. MRIDs 44261909 and 44661301 contain fipronil aerobic aquatic metabolism data on three soil:water systems all indicating the fipronil degradation pathway in Appendix 4 Figure 14, whereas MRID 49151518 contains desulfinyl aerobic aquatic metabolism data also on two soil:water systems.



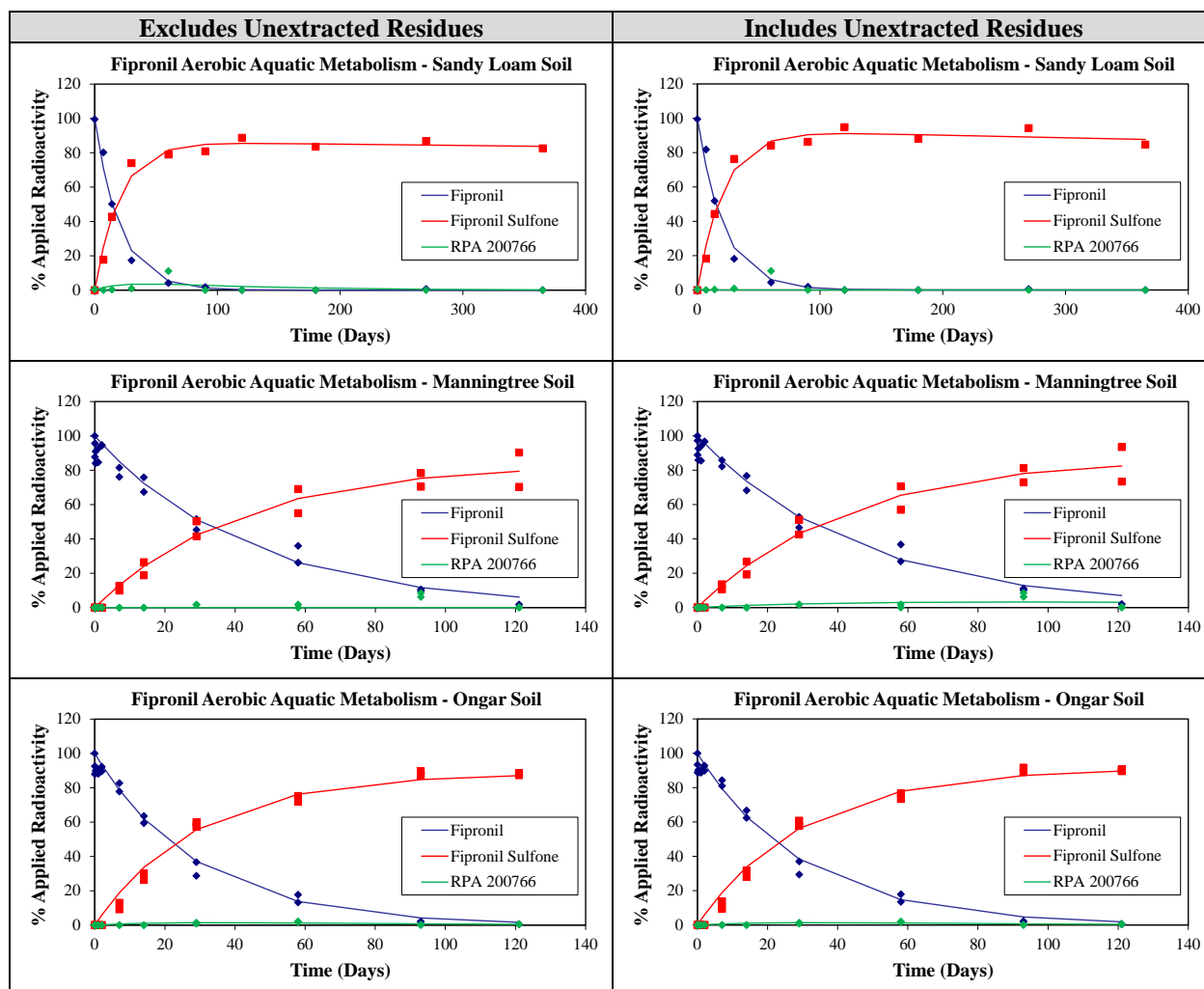
**Appendix 4 Figure 14.** Aerobic aquatic metabolism pathways for fipronil and fipronil desulfinyl.

In MRID 44261909, fipronil treated sediment was extracted three times with approximately 50 mL methanol and re-extracted three times with acetone:water:phosphoric acid (acidic acetone), (90:8:2, v/v/v). Maximum unextracted residue are 8% in sandy loam soil. In MRID 44661301, fipronil treated sediment was extracted once with methanol and re-extracted two times with acetone:water (50:50, v/v) for all samples, whereas soxhlet extraction with acetonitrile:water 50:50 (v/v) was only performed for days 14 through 121 for Manningtree soil and days 29 through 121 for Ongar soil. Maximum unextracted residue values are 7% in Manningtree soil

and 5% in Ongar soil. In MRID 49151518, desulfinyl treated sediment was extracted three times with acetonitrile only and produced maximum unextracted residue was 27% in Manningtree soil and 36% in Ongar soil.

### *Fipronil*

The quality of the fit between the modeled reaction kinetic predictions and the experimental observations is depicted in Appendix 4 Figure 15 for the soil:water system. The aquatic aerobic aquatic metabolism half-life of fipronil in the sandy loam total soil:water system is 14.2 days if unextracted residues are excluded or 14.8 days if unextracted residues are included. The aquatic aerobic aquatic metabolism half-life of fipronil in the Manningtree total soil:water system is 30.0 days if unextracted residues are excluded or 31.4 days if unextracted residues are included, whereas the aquatic aerobic aquatic metabolism half-life of fipronil in the Ongar total soil:water system is 20.3 days if unextracted residues are excluded or 21.0 days if unextracted residues are included. Taking the 90<sup>th</sup> percentile on the mean estimate, yields half-life model inputs for fipronil of 30.2 days if unextracted residues are excluded and 31.6 days if unextracted residues are included.

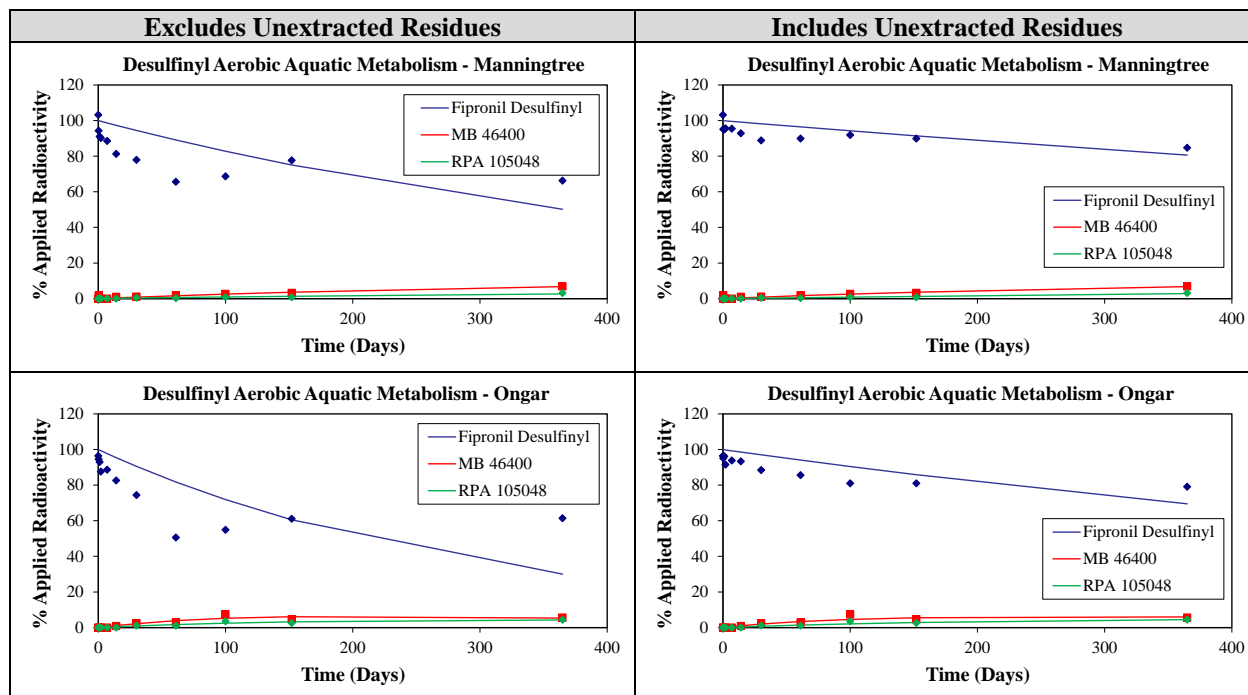


Appendix 4 Figure 15. Modeled fipronil aerobic aquatic metabolism reaction kinetics (curves) to experimental observations (dots) at 25°C.

This study also provides half-life and FF estimates for fipronil sulfone. The sulfone half-life estimate for the sandy loam soil is 7225 days with a FF of 0.865 if unextracted residues are excluded or 4088 days with a FF of 0.929 if unextracted residues are included. The sulfone half-life estimate for the Manningtree soil is 2099 days with a FF of 0.871 if unextracted residues are excluded or 1531 days with an FF of 0.921 if unextracted residues are included. The sulfone half-life estimate for the Ongar soil is stable regardless of whether the unextracted residues are excluded or included with an FF of 0.884 (excluded) or 0.914 (included). Because one of the half-lives is estimated stable, the upper end half-life model input is assumed to be stable for both the unextracted residues excluded or included values with an FF of 0.884 (excluded) or 0.930 (included).

### *Fipronil Desulfinyl*

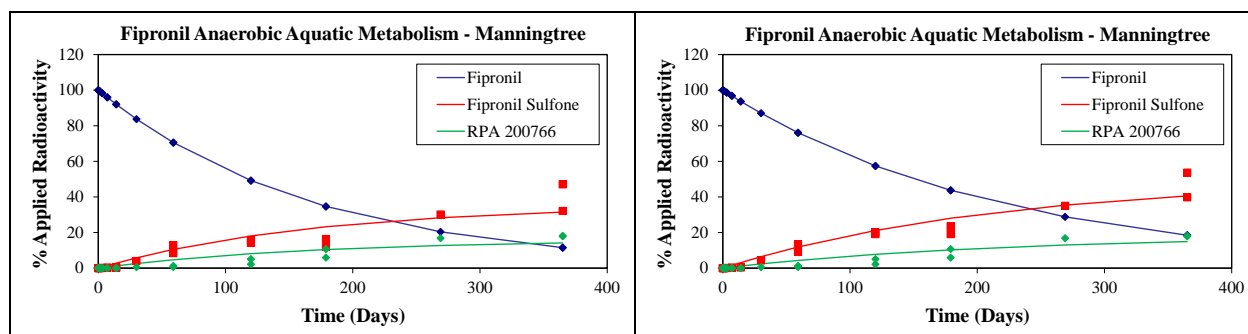
The quality of the fit between the modeled reaction kinetic predictions and the experimental observations is depicted in Appendix 4 Figure 16 for the soil:water systems. The aerobic aquatic metabolism half-life of desulfinyl in the Manningtree soil is 367 days if unextracted residues are excluded or 1172 days if unextracted residues are included. The aerobic aquatic metabolism half-life of desulfinyl in the Ongar soil is 210 days if unextracted residues are excluded or 695 days if unextracted residues are included. Taking the 90<sup>th</sup> percentile of the mean estimate, yields half-life model inputs for fipronil of 530 days if unextracted residues are excluded and 1668 days if unextracted residues are included.



**Appendix 4 Figure 16. Modeled fipronil desulfinyl aerobic aquatic metabolism reaction kinetics (curves) to experimental observations (dots) at 20°C.**

## Anaerobic Aquatic Metabolism

Fipronil followed the same degradation pathway for *anaerobic* aquatic metabolism in MRID 43291704 that was identified for *aerobic* aquatic metabolism (Appendix 4 Figure 14). The quality of the fit between the modeled reaction kinetic predictions and the experimental observations is depicted in Appendix 4 Figure 17 for the soil:water system. The aquatic aerobic soil metabolism half-life of fipronil in the Manningtree soil is 117 days if unextracted residues are excluded or 150 days if unextracted residues are included. Since only one soil:water system was studied an upper-end half-life model input was approximated as three times the single system half-life, which yielded values for fipronil of 351 days if unextracted residues are excluded and 450 days if unextracted residues are included. In MRID 43291704, fipronil treated sediment was extracted with acetonitrile alone and produced maximum unextracted residue values of 22% in Manningtree soil.



**Appendix 4 Figure 17. Modeled fipronil anaerobic aquatic metabolism reaction kinetics (curves) to experimental observations (dots) at 25°C.**

This study also provides half-life and FF estimates for fipronil sulfone. The sulfone half-life estimate for the Manningtree soil is stable regardless of whether the unextracted residues are excluded or included with an FF of 0.356 (excluded) or 0.498 (included). Because one of the half-lives is estimated stable, the upper end half-life model input is assumed to be stable for both the unextracted residues excluded or included values with an FF of 0.356 (excluded) or 0.498 (included).

### Appendix 5. Summary the NAWQA data set through 10/2/2015.

| State/Sampling Station                                       | Water-shed Area (Mi <sup>2</sup> ) | Fipronil      |             |                         | Sulfide       |             |                         | Sulfone       |             |                         | Desulfinyl    |             |                         |
|--|------------------------------------|---------------|-------------|-------------------------|---------------|-------------|-------------------------|---------------|-------------|-------------------------|---------------|-------------|-------------------------|
|  |                                    | Total Samples | % Detected  | Average Detected (ug/L) | Total Samples | % Detected  | Average Detected (ug/L) | Total Samples | % Detected  | Average Detected (ug/L) | Total Samples | % Detected  | Average Detected (ug/L) |
| <b>Alabama</b>   |                                    | <b>419</b>    | <b>29.4</b> |                         | <b>419</b>    | <b>22.7</b> |                         | <b>419</b>    | <b>15.8</b> |                         | <b>419</b>    | <b>36.0</b> |                         |
| 2339480 Oseligee Creek at County Rd 92 near Fredonia, AL     | 29.8                               | 2             | 0           |                         | 2             | 0           |                         | 2             | 0           |                         | 2             | 0           |                         |
| 2419890 Tallapoosa River near Mont.-Mont. Water Works        | 4646                               | 12            | 8.3         | 0.0033                  | 12            | 0           |                         | 12            | 0           |                         | 12            | 50.0        | 0.0043                  |
| 2424000 Cahaba River at Centreville AL                       | 1027                               | 24            | 50.0        | 0.0061                  | 24            | 37.5        | 0.003944                | 24            | 33.3        | 0.00485                 | 24            | 75.0        | 0.006539                |
| 2429500 Alabama River at Claiborne AL                        | 21967                              | 16            | 0           |                         | 16            | 0           |                         | 16            | 0           |                         | 16            | 6.3         | 0.0021                  |
| 2444490 Bogue Chitto Creek near Memphis, Alabama             | 52.6                               | 16            | 0           |                         | 16            | 0           |                         | 16            | 0           |                         | 16            | 0           |                         |
| 2469762 Tombigbee R Bl Coffeeville L&D near Coffeeville      | 18417                              | 64            | 6.3         | 0.008275                | 64            | 0           |                         | 64            | 0           |                         | 64            | 23.4        | 0.004687                |
| 2470500 Mobile River at Mt Vernon AL                         | 42867                              | 60            | 18.3        | 0.005264                | 60            | 1.7         | 0.0063                  | 60            | 1.7         | 0.0063                  | 60            | 35.0        | 0.004543                |
| 3575100 Flint River at Brownsboro, AL                        | 369                                | 74            | 16.2        | 0.005133                | 74            | 9.5         | 0.004943                | 74            | 2.7         | 0.00555                 | 74            | 16.2        | 0.004783                |
| 242354750 Cahaba Valley Creek at Cross Cr Rd at Pelham, AL.  | 25.6                               | 97            | 84.5        | 0.014795                | 97            | 80.4        | 0.007846                | 97            | 56.7        | 0.007775                | 97            | 80.4        | 0.006726                |
| 357479650 Hester Creek @ Buddy Williamson Road Nr Plevna, AL | 33                                 | 54            | 1.9         | 0.005                   | 54            | 0           |                         | 54            | 0           |                         | 54            | 0           |                         |
| <b>Alaska</b>  |                                    | <b>17</b>     | <b>0</b>    |                         | <b>17</b>     | <b>0</b>    |                         | <b>17</b>     | <b>0</b>    |                         | <b>17</b>     | <b>0</b>    |                         |
| 15565447 Yukon R at Pilot Station AK                         | 321000                             | 17            | 0           |                         | 17            | 0           |                         | 17            | 0           |                         | 17            | 0           |                         |
| <b>Arizona</b>   |                                    | <b>120</b>    | <b>12.5</b> |                         | <b>120</b>    | <b>13.3</b> |                         | <b>120</b>    | <b>3.3</b>  |                         | <b>120</b>    | <b>26.7</b> |                         |
| 9471000 San Pedro River at Charleston, AZ.                   | 1234                               | 6             | 0           |                         | 6             | 0           |                         | 6             | 0           |                         | 6             | 0           |                         |
| 9481740 Santa Cruz River at Tubac, AZ.                       | 1210                               | 18            | 27.8        | 0.00496                 | 18            | 16.7        | 0.0042                  | 18            | 5.6         | 0.0065                  | 18            | 77.8        | 0.005779                |
| 9505800 West Clear Creek near Camp Verde, AZ                 | 241                                | 6             | 0           |                         | 6             | 0           |                         | 6             | 0           |                         | 6             | 0           |                         |
| 9517000 Hassayampa River near Arlington, AZ                  | 1471                               | 18            | 55.6        | 0.00946                 | 18            | 72.2        | 0.003915                | 18            | 16.7        | 0.004567                | 18            | 100.0       | 0.005                   |
| 9522000 Colorado River at Nib                                | -999                               | 72            | 0           |                         | 72            | 0           |                         | 72            | 0           |                         | 72            | 0           |                         |
| <b>Arkansas</b>  |                                    | <b>170</b>    | <b>9.4</b>  |                         | <b>170</b>    | <b>1.2</b>  |                         | <b>170</b>    | <b>1.2</b>  |                         | <b>170</b>    | <b>18.8</b> |                         |
| 7053250 Yocum Creek near Oak Grove, AR                       | 52.8                               | 65            | 0           |                         | 65            | 0           |                         | 65            | 0           |                         | 65            | 0           |                         |

| State/Sampling Station  | Water-shed Area (Mi²) | Fipronil      |             |                         | Sulfide       |             |                         | Sulfone       |             |                         | Desulfinyl    |             |                         |
|---|-----------------------|---------------|-------------|-------------------------|---------------|-------------|-------------------------|---------------|-------------|-------------------------|---------------|-------------|-------------------------|
|   |                       | Total Samples | % Detected  | Average Detected (ug/L) | Total Samples | % Detected  | Average Detected (ug/L) | Total Samples | % Detected  | Average Detected (ug/L) | Total Samples | % Detected  | Average Detected (ug/L) |
| 7060710 North Sylamore Creek near Fifty Six, AR               | 58.1                  | 5             | 0           |                         | 5             | 0           |                         | 5             | 0           |                         | 5             | 0           |                         |
| 7263620 AR River@David D Terry L&D below Little Rock, AR      | 158429                | 100           | 16.0        | 0.004181                | 100           | 2.0         | 0.00545                 | 100           | 2.0         | 0.00575                 | 100           | 32.0        | 0.004578                |
| <b>California</b>   |                       | <b>780</b>    | <b>23.8</b> |                         | <b>780</b>    | <b>21.7</b> |                         | <b>780</b>    | <b>13.7</b> |                         | <b>780</b>    | <b>30.8</b> |                         |
| 11060400 Warm C Nr San Bernardino CA                          | 11                    | 16            | 0           |                         | 16            | 0           |                         | 16            | 0           |                         | 16            | 0           |                         |
| 11074000 Santa Ana R BI Prado Dam CA                          | 2258                  | 135           | 61.5        | 0.009329                | 135           | 71.9        | 0.005553                | 135           | 28.1        | 0.007024                | 135           | 88.9        | 0.007563                |
| 11273500 Merced R A River Road Bridge Nr Newnan CA            | 1276                  | 72            | 0           |                         | 72            | 0           |                         | 72            | 0           |                         | 72            | 0           |                         |
| 11274538 Orestimba Cr at River Rd Nr Crows Landing CA         | -999                  | 52            | 1.9         | 0.0123                  | 52            | 0           |                         | 52            | 0           |                         | 52            | 5.8         | 0.004833                |
| 11303500 San Joaquin R Nr Vernalis CA                         | 13539                 | 181           | 4.4         | 0.0058                  | 181           | 1.1         | 0.00185                 | 181           | 0           |                         | 181           | 14.4        | 0.004715                |
| 11335000 Cosumnes R A Michigan Bar CA                         | 536                   | 4             | 0           |                         | 4             | 0           |                         | 4             | 0           |                         | 4             | 0           |                         |
| 11391100 Sacramento Slough Nr Knights Landing CA              | -999                  | 16            | 0           |                         | 16            | 0           |                         | 16            | 0           |                         | 16            | 0           |                         |
| 11447360 Arcade C Nr Del Paso Heights CA                      | 31.4                  | 79            | 96.2        | 0.044803                | 79            | 87.3        | 0.01011                 | 79            | 84.8        | 0.017245                | 79            | 94.9        | 0.011379                |
| 11447650 Sacramento R A Freeport CA                           | -999                  | 137           | 10.2        | 0.004714                | 137           | 0.7         | 0.0086                  | 137           | 1.5         | 0.0051                  | 137           | 11.7        | 0.004844                |
| 11453120 Yolo Bypass A I-80 Nr W Sacramento CA                | -999                  | 1             | 0           |                         | 1             | 0           |                         | 1             | 0           |                         | 1             | 0           |                         |
| 3.72323e+14 Highline Cn Spill Nr Hilmar CA                    | -999                  | 5             | 0           |                         | 5             | 0           |                         | 5             | 0           |                         | 5             | 0           |                         |
| 3.72829e+14 Mustang C A Newport Rd Nr Ballico CA              | -999                  | 7             | 0           |                         | 7             | 0           |                         | 7             | 0           |                         | 7             | 0           |                         |
| 3.72839e+14 Mustang C A Bifurcation Structure Nr Ballico CA   | -999                  | 19            | 0           |                         | 19            | 0           |                         | 19            | 0           |                         | 19            | 0           |                         |
| 3.73012e+14 Mustang C BI Res Nr Oakdale Rd Nr Montpelier CA   | -999                  | 4             | 0           |                         | 4             | 0           |                         | 4             | 0           |                         | 4             | 0           |                         |
| 3.7302e+14 Mustang C 1.1Mi S of Monte Vista Ave Nr Montpelier | -999                  | 1             | 0           |                         | 1             | 0           |                         | 1             | 0           |                         | 1             | 0           |                         |
| 3.73112e+14 Mustang C A Monte Vista Ave Nr Montpelier CA      | -999                  | 23            | 8.7         | 0.0088                  | 23            | 0           |                         | 23            | 0           |                         | 23            | 0           |                         |
| 3.73115e+14 Culvert Discharge to Mustang C A Monte Vista Ave  | -999                  | 26            | 7.7         | 0.00975                 | 26            | 0           |                         | 26            | 0           |                         | 26            | 0           |                         |
| 3.74111e+14 Storm Drain Inlet W                               | -999                  | 1             | 0           |                         | 1             | 0           |                         | 1             | 0           |                         | 1             | 0           |                         |

| State/Sampling Station  | Water-shed Area (Mi²) | Fipronil      |            |                         | Sulfide       |            |                         | Sulfone       |            |                         | Desulfinyl    |             |                         |
|---|-----------------------|---------------|------------|-------------------------|---------------|------------|-------------------------|---------------|------------|-------------------------|---------------|-------------|-------------------------|
|   |                       | Total Samples | % Detected | Average Detected (ug/L) | Total Samples | % Detected | Average Detected (ug/L) | Total Samples | % Detected | Average Detected (ug/L) | Total Samples | % Detected  | Average Detected (ug/L) |
| Side Whitehorse Ave A Modesto                                   |                       |               |            |                         |               |            |                         |               |            |                         |               |             |                         |
| 3.74115e+14 Storm Drain Inlet S Side Wentworth Ln A Modesto CA  | -999                  | 1             | 0          |                         | 1             | 0          |                         | 1             | 0          |                         | 1             | 0           |                         |
| <b>Colorado</b>   |                       | <b>424</b>    | <b>9.4</b> |                         | <b>424</b>    | <b>2.1</b> |                         | <b>424</b>    | <b>2.4</b> |                         | <b>424</b>    | <b>11.3</b> |                         |
| 6713500 Cherry Creek at Denver, CO.                             | 410                   | 141           | 9.9        | 0.00413                 | 141           | 2.8        | 0.004079                | 141           | 2.8        | 0.727775                | 141           | 19.9        | 0.004407                |
| 6753990 Lonetree Creek near Greeley, CO.                        | 574                   | 18            | 5.6        | 0.0505                  | 18            | 5.6        | 0.0085                  | 18            | 5.6        | 0.0384                  | 18            | 5.6         | 0.0043                  |
| 6754000 South Platte River near Kersey, CO                      | 9661                  | 88            | 27.3       | 0.00304                 | 88            | 4.5        | 0.003325                | 88            | 5.7        | 1.41018                 | 88            | 20.5        | 0.004515                |
| 9163500 Colorado River near Colorado-Utah State Line            | 17849                 | 78            | 0          |                         | 78            | 0          |                         | 78            | 0          |                         | 78            | 0           |                         |
| 3.93557e+14 Dutch Creek at Weaver Park Nr Columbine Valley, CO  | 9.66                  | 2             | 0          |                         | 2             | 0          |                         | 2             | 0          |                         | 2             | 0           |                         |
| 3.93613e+14 Cottonwood Ck Ab Newark WY at Greenwood Village, CO | 7.07                  | 2             | 0          |                         | 2             | 0          |                         | 2             | 0          |                         | 2             | 0           |                         |
| 3.93948e+14 Bear Creek Bl Estes Rd at Lakewood, CO              | 249                   | 6             | 0          |                         | 6             | 0          |                         | 6             | 0          |                         | 6             | 0           |                         |
| 3.94107e+14 Sanderson Gulch Abv Lowell Ave at Denver            | 5.46                  | 2             | 0          |                         | 2             | 0          |                         | 2             | 0          |                         | 2             | 0           |                         |
| 3.94409e+14 Lakewood Gulch Abv Knox St at Denver, CO            | 15.5                  | 6             | 0          |                         | 6             | 0          |                         | 6             | 0          |                         | 6             | 0           |                         |
| 3.94553e+14 Lena Gulch at Lewis Meadows Park at Wheat Ridge CO  | 11                    | 2             | 0          |                         | 2             | 0          |                         | 2             | 0          |                         | 2             | 0           |                         |
| 3.94629e+14 Clear Creek Blw Kipling at Wheat Ridge CO           | 437                   | 2             | 0          |                         | 2             | 0          |                         | 2             | 0          |                         | 2             | 0           |                         |
| 3.94919e+14 Ralston Creek Abv Simms at Arvada CO                | 55.5                  | 6             | 0          |                         | 6             | 0          |                         | 6             | 0          |                         | 6             | 0           |                         |
| 3.94921e+14 Little Dry Ck Bl Lowell St Nr Westminster, CO       | 11.7                  | 6             | 0          |                         | 6             | 0          |                         | 6             | 0          |                         | 6             | 0           |                         |
| 3.95324e+14 Big Dry Ck Bl Hyland Cr at Westminster, CO          | 35.5                  | 2             | 0          |                         | 2             | 0          |                         | 2             | 0          |                         | 2             | 0           |                         |
| 3.95554e+14 Rock Creek Abv Rock Creek Pkwy, at Superior, CO     | 7.25                  | 2             | 0          |                         | 2             | 0          |                         | 2             | 0          |                         | 2             | 0           |                         |
| 3.95707e+14 Coal Creek Abv Mccaslin Rd at Superior, CO          | 26.7                  | 2             | 0          |                         | 2             | 0          |                         | 2             | 0          |                         | 2             | 0           |                         |
| 3.95958e+14 Dry Creek Abv Baseline Rd Nr Boulder CO             | 4.49                  | 2             | 50.0       | 0.0113                  | 2             | 0          |                         | 2             | 0          |                         | 2             | 50.0        | 0.0057                  |

| State/Sampling Station  | Water-shed Area (Mi²) | Fipronil      |             |                         | Sulfide       |            |                         | Sulfone       |            |                         | Desulfinyl    |             |                         |
|---|-----------------------|---------------|-------------|-------------------------|---------------|------------|-------------------------|---------------|------------|-------------------------|---------------|-------------|-------------------------|
|   |                       | Total Samples | % Detected  | Average Detected (ug/L) | Total Samples | % Detected | Average Detected (ug/L) | Total Samples | % Detected | Average Detected (ug/L) | Total Samples | % Detected  | Average Detected (ug/L) |
| 4e+14 S Boulder Cr at Baseline Road Nr Boulder Colo           | 130                   | 2             | 0           |                         | 2             | 0          |                         | 2             | 0          |                         | 2             | 0           |                         |
| 4.00023e+14 Bear Cr Abv Wellman Feeder Canal, at Boulder, CO  | 4.61                  | 2             | 0           |                         | 2             | 0          |                         | 2             | 0          |                         | 2             | 0           |                         |
| 4.00217e+14 Boulder Creek Blw 61St Street, Nr Boulder, CO     | 292                   | 6             | 0           |                         | 6             | 0          |                         | 6             | 0          |                         | 6             | 0           |                         |
| 4.00607e+14 Dry Creek Blw Niwot Rd, at Niwot, CO              | 21.6                  | 2             | 0           |                         | 2             | 0          |                         | 2             | 0          |                         | 2             | 0           |                         |
| 4.0081e+14 Left Hand Creek Abv Pike Rd at Longmont CO         | 72.1                  | 2             | 0           |                         | 2             | 0          |                         | 2             | 0          |                         | 2             | 0           |                         |
| 4.00855e+14 Dry Creek Blw Airport Rd Nr Longmont CO           | 11.3                  | 6             | 0           |                         | 6             | 0          |                         | 6             | 0          |                         | 6             | 0           |                         |
| 4.00925e+14 Spring Gulch at Sandstone Ranch Pk Nr Longmont CO | 14.7                  | 2             | 0           |                         | 2             | 0          |                         | 2             | 0          |                         | 2             | 0           |                         |
| 4.02549e+14 Dry Creek at Us 287, at Loveland, CO              | 6.79                  | 2             | 0           |                         | 2             | 0          |                         | 2             | 0          |                         | 2             | 0           |                         |
| 4.03035e+14 Mail Creek Nr Mouth at Fort Collins, CO           | 1.59                  | 2             | 0           |                         | 2             | 0          |                         | 2             | 0          |                         | 2             | 0           |                         |
| 4.03048e+14 Fossil Cr at College Ave, at Ft Collins, CO       | 10.8                  | 6             | 0           |                         | 6             | 0          |                         | 6             | 0          |                         | 6             | 0           |                         |
| 4.03308e+14 Boxelder Creek at Mouth, Nr Fort Collins, CO      | 286                   | 6             | 0           |                         | 6             | 0          |                         | 6             | 0          |                         | 6             | 0           |                         |
| 4.03356e+14 Spring Creek at Edora Park, at Ft Collins, CO     | 25.7                  | 2             | 0           |                         | 2             | 0          |                         | 2             | 0          |                         | 2             | 0           |                         |
| 4.042e+14 Cache La Poudre R Ab Nf Nr Ft. Collins, CO.         | 484                   | 17            | 0           |                         | 17            | 0          |                         | 17            | 0          |                         | 17            | 0           |                         |
| <b>Connecticut</b>  |                       | <b>188</b>    | <b>18.1</b> |                         | <b>188</b>    | <b>8.0</b> |                         | <b>188</b>    | <b>8.0</b> |                         | <b>188</b>    | <b>12.2</b> |                         |
| 1184000 Connecticut River at Thompsonville, CT                | 9660                  | 96            | 10.4        | 0.003747                | 96            | 1.0        | 0.0048                  | 96            | 1.0        | 1.2864                  | 96            | 3.1         | 0.004067                |
| 1209710 Norwalk River at Winnipauk,CT.                        | 33                    | 92            | 26.1        | 0.003897                | 92            | 15.2       | 0.004352                | 92            | 15.2       | 0.6845                  | 92            | 21.7        | 0.005375                |
| <b>Florida</b>  |                       | <b>201</b>    | <b>5.0</b>  |                         | <b>201</b>    | <b>5.0</b> |                         | <b>201</b>    | <b>2.0</b> |                         | <b>201</b>    | <b>26.4</b> |                         |
| 2281200 Hillsboro Canal at S-6 near Shawano                   | -999                  | 53            | 0           |                         | 53            | 0          |                         | 53            | 0          |                         | 53            | 1.9         | 0.0046                  |
| 2296750 Peace River at Arcadia, Fla.                          | 1367                  | 16            | 0           |                         | 16            | 0          |                         | 16            | 0          |                         | 16            | 0           |                         |
| 2306774 Rocky Creek at St Hwy 587 at Citrus Park FL           | 17.8                  | 42            | 4.8         | 0.00425                 | 42            | 19.0       | 0.004925                | 42            | 2.4        | 0.007                   | 42            | 40.5        | 0.004653                |

| State/Sampling Station   | Water-shed Area (Mi²) | Fipronil      |             |                         | Sulfide       |             |                         | Sulfone       |             |                         | Desulfinyl    |             |                         |
|--|-----------------------|---------------|-------------|-------------------------|---------------|-------------|-------------------------|---------------|-------------|-------------------------|---------------|-------------|-------------------------|
|  |                       | Total Samples | % Detected  | Average Detected (ug/L) | Total Samples | % Detected  | Average Detected (ug/L) | Total Samples | % Detected  | Average Detected (ug/L) | Total Samples | % Detected  | Average Detected (ug/L) |
| 2359170 Apalachicola River Nr Sumatra, Fla.                    | 19200                 | 72            | 9.7         | 0.002678                | 72            | 1.4         | 0.0076                  | 72            | 4.2         | 1.935267                | 72            | 45.8        | 0.005159                |
| 2.52414e+14 C-111 Canal 100 Ft Abv S-177 Nr Homestead          | -999                  | 16            | 0           |                         | 16            | 0           |                         | 16            | 0           |                         | 16            | 0           |                         |
| 2.80242e+14 Mas Retention Pond On Richlyne St @ Temple Terr FL | -999                  | 1             | 100.0       | 0.025                   | 1             | 100.0       | 0.0107                  | 1             | 0           |                         | 1             | 100.0       | 0.0198                  |
| 2.80248e+14 Hillsborough R at Railroad Park Nr Temple Terr FL  | -999                  | 1             | 0           |                         | 1             | 0           |                         | 1             | 0           |                         | 1             | 100.0       | 0.0037                  |
| <b>Georgia</b>   |                       | <b>785</b>    | <b>55.2</b> |                         | <b>785</b>    | <b>43.2</b> |                         | <b>785</b>    | <b>32.5</b> |                         | <b>785</b>    | <b>49.2</b> |                         |
| 2204230 Big Cotton Indian Cr at GA 138, Nr Stockbridge, GA     | 46.4                  | 2             | 100.0       | 0.00905                 | 2             | 0           |                         | 2             | 0           |                         | 2             | 0           |                         |
| 2204468 Walnut Creek at Airline Road, near McDonough, GA       | 49.6                  | 2             | 100.0       | 0.00855                 | 2             | 0           |                         | 2             | 0           |                         | 2             | 0           |                         |
| 2206314 Jackson Creek at Lester Road, near Lilburn, GA         | 20.5                  | 2             | 100.0       | 0.01155                 | 2             | 50.0        | 0.0054                  | 2             | 0           |                         | 2             | 50.0        | 0.0036                  |
| 2208150 Alcovy River at New Hope Road, near Grayson, GA        | 30.8                  | 2             | 0           |                         | 2             | 0           |                         | 2             | 0           |                         | 2             | 0           |                         |
| 2212600 Falling Creek near Juliette, GA                        | 72.2                  | 3             | 0           |                         | 3             | 0           |                         | 3             | 0           |                         | 3             | 0           |                         |
| 2213450 Little Tobesofkee Creek near Bolingbroke, GA           | 56.2                  | 2             | 0           |                         | 2             | 0           |                         | 2             | 0           |                         | 2             | 0           |                         |
| 2217293 Little Mulberry River at GA 211, Nr Hoschton, GA       | 28.4                  | 2             | 0           |                         | 2             | 0           |                         | 2             | 0           |                         | 2             | 0           |                         |
| 2217471 Beech Creek at GA 211, near Statham, GA                | 20.2                  | 2             | 0           |                         | 2             | 0           |                         | 2             | 0           |                         | 2             | 0           |                         |
| 2218700 Apalachee River near Bethlehem, GA                     | 54                    | 2             | 0           |                         | 2             | 0           |                         | 2             | 0           |                         | 2             | 0           |                         |
| 2221000 Murder Creek near Monticello, GA                       | 23.3                  | 2             | 0           |                         | 2             | 0           |                         | 2             | 0           |                         | 2             | 0           |                         |
| 2226160 Altamaha River near Everett City, GA                   | 14000                 | 86            | 17.4        | 0.00433                 | 86            | 8.1         | 0.004786                | 86            | 4.7         | 0.65645                 | 86            | 51.2        | 0.004473                |
| 2317797 Little River at Upper Ty Ty Rd near Tifton, GA         | 129                   | 36            | 0           |                         | 36            | 0           |                         | 36            | 0           |                         | 36            | 0           |                         |
| 2318500 Withlacoochee River at US 84 near Quitman, GA          | 1480                  | 66            | 50.0        | 0.01053                 | 66            | 43.9        | 0.007066                | 66            | 18.2        | 0.007658                | 66            | 50.0        | 0.005409                |
| 2334885 Suwanee Creek at Suwanee, GA                           | 47                    | 18            | 83.3        | 0.01034                 | 18            | 66.7        | 0.008208                | 18            | 38.9        | 0.007571                | 18            | 66.7        | 0.006483                |
| 2335580 Big Creek at GA 9, near Cumming, GA                    | 37.4                  | 10            | 90.0        | 0.004328                | 10            | 20.0        | 0.001659                | 10            | 70.0        | 2.295143                | 10            | 20.0        | 0.003211                |
| 2335870 Sope Creek near Marietta,                              | 30.7                  | 176           | 84.1        | 0.009459                | 176           | 71.6        | 0.005653                | 176           | 72.7        | 1.013598                | 176           | 68.2        | 0.005272                |

| State/Sampling Station                                       | Water-shed Area (Mi²) | Fipronil      |            |                         | Sulfide       |            |                         | Sulfone       |            |                         | Desulfinyl    |            |                         |
|--|-----------------------|---------------|------------|-------------------------|---------------|------------|-------------------------|---------------|------------|-------------------------|---------------|------------|-------------------------|
|  |                       | Total Samples | % Detected | Average Detected (ug/L) | Total Samples | % Detected | Average Detected (ug/L) | Total Samples | % Detected | Average Detected (ug/L) | Total Samples | % Detected | Average Detected (ug/L) |
| GA   |                       |               |            |                         |               |            |                         |               |            |                         |               |            |                         |
| 2335910 Rottenwood Cr at Interstate N Pkwy, Nr Smyrna, GA    | 18.6                  | 11            | 90.9       | 0.002574                | 11            | 18.2       | 0.001527                | 11            | 45.5       | 2.54358                 | 11            | 36.4       | 0.001483                |
| 2336526 Proctor Creek at Jackson Parkway, at Atlanta, GA     | 13.4                  | 10            | 80.0       | 0.004257                | 10            | 30.0       | 0.001283                | 10            | 50.0       | 1.99876                 | 10            | 30.0       | 0.001943                |
| 2336635 Nickajack Creek at US 78/278, near Mableton, GA      | 31.5                  | 18            | 83.3       | 0.010253                | 18            | 66.7       | 0.007683                | 18            | 44.4       | 0.007875                | 18            | 72.2       | 0.006077                |
| 2336728 Utoy Creek at Great Southwest Pkwy Nr Atlanta, GA    | 33.9                  | 2             | 50.0       | 0.0068                  | 2             | 50.0       | 0.0043                  | 2             | 0          |                         | 2             | 0          |                         |
| 2336824 Mill Cr at Morris Bennett Rd, near Hiram, GA         | 38.89                 | 2             | 0          |                         | 2             | 0          |                         | 2             | 0          |                         | 2             | 0          |                         |
| 2336876 Powder Springs Cr Oglesby Rd, Powder Springs, GA     | 25.6                  | 2             | 0          |                         | 2             | 0          |                         | 2             | 0          |                         | 2             | 0          |                         |
| 2336968 Noses Creek at Powder Springs Rd, Powder Springs, GA | 44.5                  | 18            | 77.8       | 0.008579                | 18            | 72.2       | 0.007546                | 18            | 44.4       | 0.006638                | 18            | 66.7       | 0.00615                 |
| 2337395 Dog River at North Helton Road, near Winston, GA     | 44.2                  | 6             | 0          |                         | 6             | 0          |                         | 6             | 0          |                         | 6             | 0          |                         |
| 2338000 Chattahoochee River near Whitesburg, GA              | 2430                  | 148           | 89.2       | 0.013493                | 148           | 75.0       | 0.006113                | 148           | 41.9       | 0.053485                | 148           | 81.1       | 0.006525                |
| 2338280 Whooping Creek at GA 5, near Whitesburg, GA          | 26.4                  | 2             | 0          |                         | 2             | 0          |                         | 2             | 0          |                         | 2             | 0          |                         |
| 2338375 Centralhatchee Cr Armstrong Mill Rd, Ctrlhtche, GA   | 31.9                  | 2             | 0          |                         | 2             | 0          |                         | 2             | 0          |                         | 2             | 0          |                         |
| 2338523 Hillabahatchee Creek at Thaxton Rd, Nr Franklin, GA  | 16.8                  | 12            | 0          |                         | 12            | 0          |                         | 12            | 8.3        | 1.2528                  | 12            | 0          |                         |
| 2340282 House Creek at GA 103, near Whitesville, GA          | 30                    | 2             | 0          |                         | 2             | 0          |                         | 2             | 0          |                         | 2             | 0          |                         |
| 2344340 Morning Creek at GA 54, near Fayetteville, GA        | 37                    | 2             | 0          |                         | 2             | 0          |                         | 2             | 0          |                         | 2             | 0          |                         |
| 2344480 Shoal Creek near Griffin, GA                         | 20.5                  | 6             | 0          |                         | 6             | 0          |                         | 6             | 0          |                         | 6             | 0          |                         |
| 2344737 Whitewater Cr (Ebenezer Ch Rd) Nr Fayetteville, GA   | 42                    | 5             | 100.0      | 0.00766                 | 5             | 20.0       | 0.0068                  | 5             | 0          |                         | 5             | 0          |                         |
| 2344797 White Oak Creek at Cannon Road, near Raymond, GA     | 47.3                  | 26            | 84.6       | 0.014273                | 26            | 73.1       | 0.007221                | 26            | 30.8       | 0.008538                | 26            | 73.1       | 0.005805                |
| 2344887 Red Oak Creek at GA 362, near Gay, GA                | 41.4                  | 2             | 0          |                         | 2             | 0          |                         | 2             | 0          |                         | 2             | 0          |                         |
| 2346358 Turnpike Creek near Milner, GA                       | 18.6                  | 2             | 0          |                         | 2             | 0          |                         | 2             | 0          |                         | 2             | 0          |                         |
| 2347748 Auchumpkee Cr at Allen                               | 43.2                  | 6             | 0          |                         | 6             | 0          |                         | 6             | 0          |                         | 6             | 0          |                         |

| State/Sampling Station                                       | Water-shed Area (Mi²) | Fipronil      |             |                         | Sulfide       |             |                         | Sulfone       |            |                         | Desulfinyl    |             |                         |
|--|-----------------------|---------------|-------------|-------------------------|---------------|-------------|-------------------------|---------------|------------|-------------------------|---------------|-------------|-------------------------|
|  |                       | Total Samples | % Detected  | Average Detected (ug/L) | Total Samples | % Detected  | Average Detected (ug/L) | Total Samples | % Detected | Average Detected (ug/L) | Total Samples | % Detected  | Average Detected (ug/L) |
| Rd, near Roberta, GA   |                       |               |             |                         |               |             |                         |               |            |                         |               |             |                         |
| 2350080 Lime Creek near Cobb, GA                             | 61.4                  | 87            | 0           |                         | 87            | 0           |                         | 87            | 0          |                         | 87            | 3.4         | 0.0057                  |
| 3.20132e+14 Dominy Br Upstr From Acfb Fss Wells, Nr Cobb, GA | -999                  | 1             | 0           |                         | 1             | 0           |                         | 1             | 0          |                         | 1             | 0           |                         |
| <b>Idaho</b>   |                       | <b>238</b>    | <b>0.8</b>  |                         | <b>238</b>    | <b>0.4</b>  |                         | <b>238</b>    | <b>0.4</b> |                         | <b>238</b>    | <b>0.4</b>  |                         |
| 13055000 Teton River Nr St Anthony ID                        | 876                   | 13            | 0           |                         | 13            | 0           |                         | 13            | 0          |                         | 13            | 0           |                         |
| 13056500 Henrys Fork Nr Rexburg ID                           | 2920                  | 12            | 0           |                         | 12            | 0           |                         | 12            | 0          |                         | 12            | 0           |                         |
| 13090999 Blue Lakes Spring Bel Pump Plant Nr Twin Falls ID   | -999                  | 1             | 0           |                         | 1             | 0           |                         | 1             | 0          |                         | 1             | 0           |                         |
| 13092747 Rock Creek Ab Hwy 30/93 Xing at Twin Falls ID       | 259                   | 119           | 1.7         | 0.105171                | 119           | 0.8         | 0.206502                | 119           | 0.8        | 202.7977                | 119           | 0.8         | 0.206218                |
| 13154500 Snake River at King Hill ID                         | 35800                 | 93            | 0           |                         | 93            | 0           |                         | 93            | 0          |                         | 93            | 0           |                         |
| <b>Illinois</b>  |                       | <b>971</b>    | <b>33.4</b> |                         | <b>971</b>    | <b>16.0</b> |                         | <b>971</b>    | <b>8.5</b> |                         | <b>971</b>    | <b>28.5</b> |                         |
| 3336645 Middle Fork Vermilion River Above Oakwood, IL        | 432                   | 12            | 0           |                         | 12            | 0           |                         | 12            | 0          |                         | 12            | 0           |                         |
| 3336890 Spoon River near St. Joseph, IL                      | 40.7                  | 12            | 0           |                         | 12            | 0           |                         | 12            | 0          |                         | 12            | 0           |                         |
| 3384450 Lusk Creek near Eddyville, IL                        | 42.9                  | 11            | 0           |                         | 11            | 0           |                         | 11            | 0          |                         | 11            | 0           |                         |
| 3611200 Massac Creek at Metropolis, IL                       | 38                    | 12            | 0           |                         | 12            | 0           |                         | 12            | 0          |                         | 12            | 0           |                         |
| 3612500 Ohio River at Dam 53 near Grand Chain, IL            | 203100                | 153           | 20.9        | 0.004807                | 153           | 2.6         | 0.006275                | 153           | 1.3        | 0.1639                  | 153           | 20.3        | 0.004221                |
| 5525500 Sugar Creek at Milford, IL                           | 446                   | 16            | 6.3         | 0.0198                  | 16            | 0           |                         | 16            | 6.3        | 0.0097                  | 16            | 6.3         | 0.0023                  |
| 5531500 Salt Creek at Western Springs, IL                    | 115                   | 84            | 88.1        | 0.014039                | 84            | 59.5        | 0.006834                | 84            | 17.9       | 0.063907                | 84            | 75.0        | 0.005873                |
| 5532500 Des Plaines River at Riverside, IL                   | 630                   | 39            | 76.9        | 0.017227                | 39            | 48.7        | 0.004805                | 39            | 12.8       | 0.0069                  | 39            | 56.4        | 0.005668                |
| 5550500 Poplar Creek at Elgin, IL                            | 35.2                  | 12            | 33.3        | 0.001055                | 12            | 25.0        | 0.000508                | 12            | 0          |                         | 12            | 33.3        | 0.000569                |
| 5553500 Illinois River at Ottawa, IL                         | 10949                 | 16            | 43.8        | 0.006786                | 16            | 0           |                         | 16            | 0          |                         | 16            | 0           |                         |
| 5554300 Indian Creek near Fairbury, IL                       | 67.5                  | 12            | 0           |                         | 12            | 0           |                         | 12            | 0          |                         | 12            | 0           |                         |
| 5572000 Sangamon River at                                    | 550                   | 105           | 29.5        | 0.011242                | 105           | 24.8        | 0.006204                | 105           | 20.0       | 0.051676                | 105           | 36.2        | 0.004805                |

| State/Sampling Station  | Water-shed Area (Mi²) | Fipronil      |             |                         | Sulfide       |            |                         | Sulfone       |            |                         | Desulfinyl    |             |                         |
|---|-----------------------|---------------|-------------|-------------------------|---------------|------------|-------------------------|---------------|------------|-------------------------|---------------|-------------|-------------------------|
|   |                       | Total Samples | % Detected  | Average Detected (ug/L) | Total Samples | % Detected | Average Detected (ug/L) | Total Samples | % Detected | Average Detected (ug/L) | Total Samples | % Detected  | Average Detected (ug/L) |
| Monticello, IL  |                       |               |             |                         |               |            |                         |               |            |                         |               |             |                         |
| 5575550 Clear Creek near Jeisyville, IL                             | 13.79                 | 8             | 0           |                         | 8             | 0          |                         | 8             | 0          |                         | 8             | 0           |                         |
| 5586100 Illinois River at Valley City, IL                           | 26743                 | 123           | 63.4        | 0.006081                | 123           | 37.4       | 0.005211                | 123           | 12.2       | 0.639047                | 123           | 63.4        | 0.005098                |
| 5587455 Mississippi River below Grafton, IL                         | 171300                | 107           | 21.5        | 0.005492                | 107           | 1.9        | 0.0057                  | 107           | 7.5        | 0.58805                 | 107           | 19.6        | 0.004852                |
| 5592195 Beck Creek at Herrick, IL                                   | 97                    | 12            | 50.0        | 0.002595                | 12            | 0          |                         | 12            | 33.3       | 0.84935                 | 12            | 16.7        | 0.000816                |
| 5599100 Galum Creek near Pyatts, IL                                 | 162                   | 12            | 0           |                         | 12            | 0          |                         | 12            | 0          |                         | 12            | 0           |                         |
| 7022000 Mississippi River at Thebes, IL                             | 713200                | 134           | 21.6        | 0.004653                | 134           | 1.5        | 0.004                   | 134           | 3.7        | 0.63366                 | 134           | 11.9        | 0.004175                |
| 3.84224e+14 Allison Ditch near Vincennes, IN                        | -999                  | 12            | 0           |                         | 12            | 0          |                         | 12            | 0          |                         | 12            | 0           |                         |
| 3.8573e+14 Little Wabash River near Mason, IL                       | -999                  | 11            | 72.7        | 0.001862                | 11            | 27.3       | 0.0004                  | 11            | 36.4       | 0.9015                  | 11            | 9.1         | 0.000632                |
| 3.91136e+14 Cole Creek near Hardin, IL                              | -999                  | 11            | 0           |                         | 11            | 0          |                         | 11            | 0          |                         | 11            | 0           |                         |
| 3.91601e+14 Mill Creek near Choctaw, IL                             | -999                  | 12            | 8.3         | 0.000711                | 12            | 0          |                         | 12            | 8.3        | 0.8421                  | 12            | 0           |                         |
| 4.00856e+14 Herget Drainage Ditch near Kilbourne, IL                | -999                  | 12            | 0           |                         | 12            | 0          |                         | 12            | 16.7       | 1.421                   | 12            | 0           |                         |
| 4.04917e+14 North Fork Vermilion River near Wing                    | -999                  | 12            | 0           |                         | 12            | 0          |                         | 12            | 0          |                         | 12            | 0           |                         |
| 4.12911e+14 Green River near Hooppole, IL                           | -999                  | 10            | 0           |                         | 10            | 0          |                         | 10            | 0          |                         | 10            | 0           |                         |
| 4.20626e+14 Stillman Creek at Stillman Valley, IL                   | -999                  | 11            | 0           |                         | 11            | 0          |                         | 11            | 0          |                         | 11            | 0           |                         |
| <b>Indiana</b>  |                       | <b>928</b>    | <b>25.4</b> |                         | <b>928</b>    | <b>8.6</b> |                         | <b>928</b>    | <b>8.6</b> |                         | <b>928</b>    | <b>20.6</b> |                         |
| 3303280 Ohio River at Cannelton Dam at Cannelton, IN                | 97000                 | 150           | 29.3        | 0.004778                | 150           | 4.0        | 0.004967                | 150           | 2.7        | 1.328675                | 150           | 21.3        | 0.004581                |
| 3340900 Big Raccoon Creek at Ferndale, IN                           | 222                   | 12            | 0           |                         | 12            | 0          |                         | 12            | 8.3        | 0.4255                  | 12            | 0           |                         |
| 3351072 Williams Creek at 96 <sup>th</sup> Street, Indianapolis, IN | 16.3                  | 12            | 66.7        | 0.002909                | 12            | 16.7       | 0.000374                | 12            | 58.3       | 1.4188                  | 12            | 41.7        | 0.002034                |
| 3352875 Fall Creek at 16 <sup>th</sup> Street at Indianapolis, IN   | 317                   | 12            | 25.0        | 0.001328                | 12            | 0          |                         | 12            | 0          |                         | 12            | 16.7        | 0.000562                |
| 3353200 Eagle Creek at Zionsville, IN                               | 106                   | 18            | 66.7        | 0.002667                | 18            | 5.6        | 0.000345                | 18            | 5.6        | 1.1303                  | 18            | 22.2        | 0.001624                |
| 3353637 Little Buck Creek near                                      | 17                    | 25            | 24.0        | 0.0083                  | 25            | 0          |                         | 25            | 0          |                         | 25            | 4.0         | 0.0033                  |

| State/Sampling Station   | Water-shed Area (Mi²) | Fipronil      |             |                         | Sulfide       |            |                         | Sulfone       |            |                         | Desulfinyl    |             |                         |
|--|-----------------------|---------------|-------------|-------------------------|---------------|------------|-------------------------|---------------|------------|-------------------------|---------------|-------------|-------------------------|
|  |                       | Total Samples | % Detected  | Average Detected (ug/L) | Total Samples | % Detected | Average Detected (ug/L) | Total Samples | % Detected | Average Detected (ug/L) | Total Samples | % Detected  | Average Detected (ug/L) |
| Indianapolis, IN   |                       |               |             |                         |               |            |                         |               |            |                         |               |             |                         |
| 3357330 Big Walnut Creek near Roachdale, IN                              | 131                   | 46            | 10.9        | 0.00482                 | 46            | 8.7        | 0.005925                | 46            | 15.2       | 0.005171                | 46            | 26.1        | 0.004683                |
| 3361638 Leary-Weber Ditch at Mohawk, IN                                  | 2.79                  | 48            | 0           |                         | 48            | 0          |                         | 48            | 0          |                         | 48            | 0           |                         |
| 3374100 White River at Hazleton, IN                                      | 11305                 | 140           | 42.1        | 0.006151                | 140           | 25.7       | 0.005439                | 140           | 14.3       | 0.0058                  | 140           | 61.4        | 0.004837                |
| 3378500 Wabash River at New Harmony, IN                                  | 29234                 | 152           | 29.6        | 0.005351                | 152           | 9.9        | 0.005355                | 152           | 13.2       | 0.14707                 | 152           | 21.1        | 0.004413                |
| 5517000 Yellow River at Knox, IN   | 435                   | 12            | 16.7        | 0.005155                | 12            | 0          |                         | 12            | 0          |                         | 12            | 0           |                         |
| 3.8424e+14 Prairie Cr at Co Rd N100W Nr Capehart, IN                     | 122.7                 | 11            | 27.3        | 0.001205                | 11            | 27.3       | 0.000523                | 11            | 63.6       | 1.699457                | 11            | 9.1         | 0.000286                |
| 3.90033e+14 Otter Cr at N Cord 560E Nr Butlerville, IN                   | 61.5                  | 12            | 0           |                         | 12            | 0          |                         | 12            | 0          |                         | 12            | 0           |                         |
| 3.9111e+14 W Fk Busseron Cr at St Rt 48 Nr Wilfred IN                    | 14.31                 | 12            | 25.0        | 0.001208                | 12            | 0          |                         | 12            | 0          |                         | 12            | 0           |                         |
| 3.91114e+14 Otter Creek at W County Rd 750N Nr Napoleon, IN              | 1.23                  | 12            | 0           |                         | 12            | 0          |                         | 12            | 8.3        | 3.3442                  | 12            | 0           |                         |
| 3.92158e+14 Nineveh Cr at Stone Arch Rd Nr Nineveh, IN                   | 6.37                  | 12            | 16.7        | 0.003469                | 12            | 8.3        | 0.000128                | 12            | 16.7       | 0.32585                 | 12            | 0           |                         |
| 3.94253e+14 Lick Cr at N Cord 250W near Harrisburg, IN                   | 3.37                  | 12            | 0           |                         | 12            | 0          |                         | 12            | 0          |                         | 12            | 0           |                         |
| 3.9434e+14 Sugar Creek at Co Rd 400 S at New Palestine, IN               | 92.6                  | 166           | 19.9        | 0.008458                | 166           | 5.4        | 0.005289                | 166           | 6.0        | 0.00497                 | 166           | 6.0         | 0.00453                 |
| 3.95743e+14 White R, W Bank, 1 Rmi US 116 <sup>th</sup> St at Fishers IN | 1168.4                | 29            | 37.9        | 0.007691                | 29            | 6.9        | 0.0045                  | 29            | 0          |                         | 29            | 20.7        | 0.004833                |
| 4.01849e+14 Big Pine Cr at Co Rd N125E Nr Williamsport, IN               | 326                   | 12            | 0           |                         | 12            | 8.3        | 0.00163                 | 12            | 0          |                         | 12            | 0           |                         |
| 4.03242e+14 Limberlost Creek at Cord N 250 E near Bryant, IN             | 31.07                 | 12            | 0           |                         | 12            | 0          |                         | 12            | 0          |                         | 12            | 0           |                         |
| 4.11439e+14 Hodge Ditch Stream at Cord N400W Nr Wheatfield, IN           | 44.62                 | 11            | 0           |                         | 11            | 0          |                         | 11            | 0          |                         | 11            | 0           |                         |
| <b>Iowa</b>  |                       | <b>504</b>    | <b>11.3</b> |                         | <b>504</b>    | <b>5.6</b> |                         | <b>504</b>    | <b>3.6</b> |                         | <b>504</b>    | <b>17.5</b> |                         |
| 5418400 North Fork Maquoketa River near Fulton, IA                       | 505                   | 6             | 0           |                         | 6             | 0          |                         | 6             | 0          |                         | 6             | 0           |                         |
| 5420500 Mississippi River at Clinton, IA                                 | 85600                 | 116           | 6.9         | 0.005588                | 116           | 3.4        | 0.00665                 | 116           | 1.7        | 0.00535                 | 116           | 12.1        | 0.004107                |
| 5420680 Wapsipinicon River near Tripoli, IA                              | 346                   | 62            | 4.8         | 0.0064                  | 62            | 1.6        | 0.0078                  | 62            | 11.3       | 0.004929                | 62            | 8.1         | 0.00448                 |
| 5449500 Iowa River near Rowan,   | 429                   | 16            | 0           |                         | 16            | 0          |                         | 16            | 0          |                         | 16            | 0           |                         |

| State/Sampling Station                                      | Water-shed Area (Mi <sup>2</sup> ) | Fipronil      |             |                         | Sulfide       |             |                         | Sulfone       |             |                         | Desulfinyl    |             |                         |
|---|------------------------------------|---------------|-------------|-------------------------|---------------|-------------|-------------------------|---------------|-------------|-------------------------|---------------|-------------|-------------------------|
|   |                                    | Total Samples | % Detected  | Average Detected (ug/L) | Total Samples | % Detected  | Average Detected (ug/L) | Total Samples | % Detected  | Average Detected (ug/L) | Total Samples | % Detected  | Average Detected (ug/L) |
| IA  |                                    |               |             |                         |               |             |                         |               |             |                         |               |             |                         |
| 5451070 South Fork Iowa River Headwaters Nr Blairsburg, IA  | 2.7                                | 8             | 0           |                         | 8             | 0           |                         | 8             | 0           |                         | 8             | 0           |                         |
| 5451080 South Fork Iowa River near Blairsburg, IA           | 12                                 | 3             | 0           |                         | 3             | 0           |                         | 3             | 0           |                         | 3             | 0           |                         |
| 5451210 South Fork Iowa River NE of New Providence, IA      | 224                                | 132           | 0.8         | 0.0039                  | 132           | 3.0         | 0.0055                  | 132           | 2.3         | 0.0053                  | 132           | 5.3         | 0.004629                |
| 5454500 Iowa River at Iowa City, IA                         | 3271                               | 12            | 16.7        | 0.00505                 | 12            | 16.7        | 0.00635                 | 12            | 8.3         | 0.007                   | 12            | 41.7        | 0.00544                 |
| 5465500 Iowa River at Wapello, IA                           | 12500                              | 92            | 29.3        | 0.004426                | 92            | 16.3        | 0.005027                | 92            | 1.1         | 0.0068                  | 92            | 34.8        | 0.003722                |
| 5490500 Des Moines River at Keosauqua, IA                   | 14038                              | 57            | 28.1        | 0.003969                | 57            | 3.5         | 0.00425                 | 57            | 7.0         | 0.00475                 | 57            | 43.9        | 0.003852                |
| <b>Kansas</b>   |                                    | <b>88</b>     | <b>37.5</b> |                         | <b>88</b>     | <b>23.9</b> |                         | <b>88</b>     | <b>40.9</b> |                         | <b>88</b>     | <b>33.0</b> |                         |
| 6892350 Kansas R at Desoto, KS                              | 59756                              | 25            | 28.0        | 0.001573                | 25            | 4.0         | 0.000739                | 25            | 44.0        | 1.3167                  | 25            | 16.0        | 0.000587                |
| 6893350 Tomahawk C Nr Overland Park, KS                     | 20.5                               | 12            | 100.0       | 0.020568                | 12            | 91.7        | 0.002581                | 12            | 100.0       | 13.26179                | 12            | 75.0        | 0.004892                |
| 7144100 L Arkansas R Nr Sedgwick, KS                        | 1239                               | 27            | 48.1        | 0.003443                | 27            | 33.3        | 0.000992                | 27            | 48.1        | 1.694946                | 27            | 59.3        | 0.002074                |
| 3.93358e+14 French C at Parallel Rd, Onaga, KS              | -999                               | 12            | 0           |                         | 12            | 0           |                         | 12            | 0           |                         | 12            | 0           |                         |
| 3.94306e+14 Muddy C at 145 <sup>th</sup> St Nr Wetmore, KS  | -999                               | 12            | 8.3         | 0.00094                 | 12            | 0           |                         | 12            | 0           |                         | 12            | 0           |                         |
| <b>Kentucky</b>   |                                    | <b>145</b>    | <b>2.1</b>  |                         | <b>145</b>    | <b>1.4</b>  |                         | <b>145</b>    | <b>3.4</b>  |                         | <b>145</b>    | <b>15.2</b> |                         |
| 3318800 Caney Creek near Horse Branch, KY                   | 124                                | 10            | 0           |                         | 10            | 0           |                         | 10            | 0           |                         | 10            | 0           |                         |
| 3383782 Richland Creek at Carbondale Rd near Richland, KY   | 12                                 | 12            | 0           |                         | 12            | 0           |                         | 12            | 0           |                         | 12            | 0           |                         |
| 3609750 Tennessee River at Highway 60 near Paducah, KY      | 40330                              | 111           | 2.7         | 0.004033                | 111           | 1.8         | 0.000177                | 111           | 4.5         | 0.9288                  | 111           | 19.8        | 0.004804                |
| 3.73514e+14 Pond Run at Highway 110 near Falls of Rough, KY | 4.57                               | 12            | 0           |                         | 12            | 0           |                         | 12            | 0           |                         | 12            | 0           |                         |
| <b>Louisiana</b>  |                                    | <b>1142</b>   | <b>33.9</b> |                         | <b>1122</b>   | <b>28.9</b> |                         | <b>1142</b>   | <b>24.3</b> | <b>0.068639</b>         | <b>1122</b>   | <b>41.0</b> |                         |
| 7373420 Mississippi R Nr St. Francisville, LA               | 1125300                            | 165           | 17.6        | 0.004201                | 165           | 6.1         | 0.00569                 | 165           | 2.4         | 0.6987                  | 165           | 24.8        | 0.00398                 |
| 7374000 Mississippi River at Baton Rouge, LA                | 1125810                            | 135           | 21.5        | 0.004497                | 135           | 6.7         | 0.005411                | 135           | 1.5         | 0.00585                 | 135           | 25.9        | 0.004326                |
| 7374525 Mississippi River at Belle Chasse, LA               | 1130000                            | 107           | 23.4        | 0.005564                | 107           | 9.3         | 0.00552                 | 107           | 0.9         | 0.2157                  | 107           | 27.1        | 0.004279                |
| 7375050 Tchefuncte River near                               | 145                                | 22            | 4.5         | 0.0034                  | 22            | 9.1         | 0.00235                 | 22            | 0           |                         | 22            | 4.5         | 0.0021                  |

| State/Sampling Station                                       | Water-shed Area (Mi²) | Fipronil      |            |                         | Sulfide       |            |                         | Sulfone       |            |                         | Desulfinyl    |            |                         |
|--|-----------------------|---------------|------------|-------------------------|---------------|------------|-------------------------|---------------|------------|-------------------------|---------------|------------|-------------------------|
|  |                       | Total Samples | % Detected | Average Detected (ug/L) | Total Samples | % Detected | Average Detected (ug/L) | Total Samples | % Detected | Average Detected (ug/L) | Total Samples | % Detected | Average Detected (ug/L) |
| Covington, LA  |                       |               |            |                         |               |            |                         |               |            |                         |               |            |                         |
| 7379960 Dawson Cr. at Bluebonnet Blvd near Baton Rouge, LA   | 15.11                 | 29            | 89.7       | 0.035415                | 29            | 93.1       | 0.012726                | 29            | 82.8       | 0.018888                | 29            | 93.1       | 0.009863                |
| 7381495 (Coe) Atchafalaya River at Melville, LA              | 93316                 | 165           | 15.8       | 0.004713                | 165           | 6.1        | 0.00532                 | 165           | 5.5        | 0.284089                | 165           | 18.2       | 0.004437                |
| 7381590 Wax Lake Outlet at Calumet, LA                       | -999                  | 104           | 22.1       | 0.005309                | 104           | 4.8        | 0.00554                 | 104           | 3.8        | 0.325275                | 104           | 26.9       | 0.004133                |
| 7381600 Lower Atchafalaya River at Morgan City, LA           | -999                  | 115           | 22.6       | 0.005014                | 115           | 6.1        | 0.005314                | 115           | 2.6        | 0.4311                  | 115           | 28.7       | 0.004174                |
| 8010000 Bayou Des Cannes near Eunice, LA                     | 131                   | 25            | 72.0       | 1.082317                | 23            | 91.3       | 0.093237                | 25            | 92.0       | 0.075866                | 23            | 91.3       | 0.293321                |
| 8010500 Byu Wikoff Nr Rayne, LA                              | 51.3                  | 8             | 62.5       | 0.243312                | 7             | 85.7       | 0.02257                 | 8             | 87.5       | 0.02185                 | 7             | 85.7       | 0.111178                |
| 8011020 Bayou Plaquemine Brule @ Estherwood, LA.             | 302.6                 | 7             | 71.4       | 0.98296                 | 6             | 100.0      | 0.07716                 | 7             | 100.0      | 0.058336                | 6             | 100.0      | 0.21043                 |
| 8011500 Boggy Bayou @ LA-Hwy 106 Nr Pine Prairie, LA         | 51.3                  | 3             | 33.3       | 0.00383                 | 3             | 100.0      | 0.001718                | 3             | 0          |                         | 3             | 66.7       | 0.00209                 |
| 8011800 Castor Cr @ Cottingin Castor Rd. Nr Oberlin, LA      | 43.9                  | 3             | 66.7       | 1.732                   | 3             | 100.0      | 0.267753                | 3             | 100.0      | 0.084677                | 3             | 100.0      | 0.15809                 |
| 8011860 Bayou Nezpique @ La-Hwy 376 N of Basile, LA          | 194.35                | 8             | 87.5       | 0.564893                | 7             | 100.0      | 0.090643                | 8             | 100.0      | 0.036336                | 7             | 100.0      | 0.106829                |
| 8012150 Mermentau River at Mermentau, LA                     | 1381                  | 100           | 69.0       | 0.265884                | 97            | 88.7       | 0.030533                | 100           | 62.0       | 0.032155                | 97            | 81.4       | 0.060339                |
| 8012300 Byu Queue De Tortue @ Riceville, LA                  | -999                  | 5             | 80.0       | 1.292075                | 4             | 100.0      | 0.107075                | 5             | 100.0      | 0.073802                | 4             | 100.0      | 0.262325                |
| 8012400 Mermentau River @ Lake Arthur, LA                    | 1723                  | 5             | 80.0       | 0.31095                 | 4             | 100.0      | 0.071275                | 5             | 100.0      | 0.0382                  | 4             | 100.0      | 0.110175                |
| 8012447 Bayou Chene at St. Hwy. 382 Nr. Welsh, LA.           | 104.74                | 5             | 80.0       | 1.0434                  | 4             | 100.0      | 0.11075                 | 5             | 100.0      | 0.0383                  | 4             | 100.0      | 0.14515                 |
| 8012470 Bayou Lacassine near Lake Arthur, LA                 | 299                   | 50            | 64.0       | 0.385356                | 48            | 91.7       | 0.032532                | 50            | 92.0       | 0.022175                | 48            | 91.7       | 0.055634                |
| 8014500 Ouiska Chitto Creek near Oberlin, LA                 | 510                   | 16            | 0          |                         | 16            | 0          |                         | 16            | 0          |                         | 16            | 0          |                         |
| 3.00446e+14 Bayou Queue De Tortue at LA-Hwy 13 Nr Leleux, LA | 88.56                 | 7             | 71.4       | 1.435256                | 6             | 100.0      | 0.085477                | 7             | 100.0      | 0.066301                | 6             | 100.0      | 0.196833                |
| 3.00514e+14 Bayou Grand Marais at LA-Hwy 699 Nr Kaplan, LA   | 20.92                 | 3             | 100.0      | 0.16203                 | 3             | 100.0      | 0.012913                | 3             | 100.0      | 0.011903                | 3             | 100.0      | 0.060167                |
| 3.01154e+14 Bayou Queue De Tortue at Theriot Rd. Nr Rayne,   | 25.26                 | 3             | 66.7       | 0.16115                 | 3             | 100.0      | 0.04477                 | 3             | 66.7       | 0.03495                 | 3             | 100.0      | 0.06475                 |

| State/Sampling Station   | Water-shed Area (Mi²) | Fipronil      |             |                         | Sulfide       |             |                         | Sulfone       |             |                         | Desulfinyl    |             |                         |
|--|-----------------------|---------------|-------------|-------------------------|---------------|-------------|-------------------------|---------------|-------------|-------------------------|---------------|-------------|-------------------------|
|  |                       | Total Samples | % Detected  | Average Detected (ug/L) | Total Samples | % Detected  | Average Detected (ug/L) | Total Samples | % Detected  | Average Detected (ug/L) | Total Samples | % Detected  | Average Detected (ug/L) |
| LA   |                       |               |             |                         |               |             |                         |               |             |                         |               |             |                         |
| 3.0152e+14 E Bayou Lacassine at LA-Hwy 99 N of Welsh, LA       | 23.1                  | 8             | 75.0        | 1.6911                  | 7             | 100.0       | 0.090071                | 8             | 100.0       | 0.076288                | 7             | 100.0       | 0.12492                 |
| 3.01538e+14 W Bayou Grand Marais at Aaron Rd. Nr Roanoke       | 54.38                 | 5             | 100.0       | 1.308236                | 4             | 100.0       | 0.103375                | 5             | 100.0       | 0.07596                 | 4             | 100.0       | 0.1611                  |
| 3.01959e+14 Bayou Des Cannes at LA-Hwy 98 West of Iota, LA     | 358.5                 | 4             | 100.0       | 1.26476                 | 3             | 100.0       | 0.140533                | 4             | 100.0       | 0.0812                  | 3             | 100.0       | 0.333333                |
| 3.02128e+14 Bayou Nezpique near Panchoville, LA                | 550.21                | 4             | 75.0        | 1.117633                | 4             | 100.0       | 0.137125                | 4             | 100.0       | 0.06385                 | 4             | 100.0       | 0.14065                 |
| 3.02403e+14 Bayou Plaquemine Brule @ LA-Hwy 370 Nr Churchpoint | 64.19                 | 8             | 62.5        | 0.354098                | 7             | 100.0       | 0.011331                | 8             | 87.5        | 0.02206                 | 7             | 100.0       | 0.169343                |
| 3.02749e+14 Bayou Mallet at LA Hwy 367 near Eunice, LA         | 79.62                 | 6             | 66.7        | 0.395875                | 5             | 100.0       | 0.03974                 | 6             | 100.0       | 0.022415                | 5             | 100.0       | 0.11824                 |
| 3.03206e+14 Bayou Nezpique at Guidry Rd. N of Basile, LA       | 385                   | 8             | 87.5        | 1.384929                | 7             | 100.0       | 0.103729                | 8             | 100.0       | 0.070525                | 7             | 100.0       | 0.213929                |
| 3.03209e+14 Bayou Blue at LA-Hwy 26 Nr Elton, LA               | 94.02                 | 3             | 100.0       | 2.946667                | 3             | 100.0       | 0.301133                | 3             | 100.0       | 0.146333                | 3             | 100.0       | 0.273667                |
| 3.03755e+14 Bayou Des Cannes @ LA-Hwy 104 Nr Ville Platte, LA  | 47.82                 | 3             | 100.0       | 1.638                   | 3             | 100.0       | 0.132867                | 3             | 100.0       | 0.1356                  | 3             | 100.0       | 0.773                   |
| 3.0413e+14 Caney Creek at Bond Rd. near Oakdale, LA            | 24.85                 | 3             | 33.3        | 0.00515                 | 3             | 33.3        | 0.000972                | 3             | 0           |                         | 3             | 33.3        | 0.00133                 |
| <b>Maryland</b>  |                       | <b>135</b>    | <b>14.8</b> |                         | <b>135</b>    | <b>0</b>    |                         | <b>135</b>    | <b>0</b>    |                         | <b>135</b>    | <b>13.3</b> |                         |
| 1493499 Morgan Creek near Worton, MD                           | 10.57                 | 2             | 0           |                         | 2             | 0           |                         | 2             | 0           |                         | 2             | 0           |                         |
| 1493500 Morgan Creek near Kennedyville, MD                     | 12.7                  | 57            | 1.8         | 0.0062                  | 57            | 0           |                         | 57            | 0           |                         | 57            | 0           |                         |
| 1578310 Susquehanna River at Conowingo, MD                     | 27100                 | 69            | 27.5        | 0.004168                | 69            | 0           |                         | 69            | 0           |                         | 69            | 26.1        | 0.0049                  |
| 149349945 Morgan Crk Trib Nr Mornec Rd Nr Worton, MD           | 11.1                  | 1             | 0           |                         | 1             | 0           |                         | 1             | 0           |                         | 1             | 0           |                         |
| 149349949 Morgan Crk. Trib Nr Worton, MD                       | 11.1                  | 2             | 0           |                         | 2             | 0           |                         | 2             | 0           |                         | 2             | 0           |                         |
| 149349970 Morgan Crk Trib Nr Wallis Rd Nr Kennedyville, MD     | 12.6                  | 2             | 0           |                         | 2             | 0           |                         | 2             | 0           |                         | 2             | 0           |                         |
| 149349980 Farm Pond Nr Kennedyville, MD                        | 0.3                   | 2             | 0           |                         | 2             | 0           |                         | 2             | 0           |                         | 2             | 0           |                         |
| <b>Massachusetts</b>   |                       | <b>132</b>    | <b>38.6</b> |                         | <b>132</b>    | <b>32.6</b> |                         | <b>132</b>    | <b>17.4</b> |                         | <b>132</b>    | <b>33.3</b> |                         |
| 1096538 Merrimack River Municipal Source - Raw Intake          | -999                  | 4             | 50.0        | 0.0077                  | 4             | 25.0        | 0.0079                  | 4             | 25.0        | 0.005                   | 4             | 75.0        | 0.0052                  |

| State/Sampling Station   | Water-shed Area (Mi²) | Fipronil      |             |                         | Sulfide       |             |                         | Sulfone       |             |                         | Desulfinyl    |             |                         |
|--|-----------------------|---------------|-------------|-------------------------|---------------|-------------|-------------------------|---------------|-------------|-------------------------|---------------|-------------|-------------------------|
|  |                       | Total Samples | % Detected  | Average Detected (ug/L) | Total Samples | % Detected  | Average Detected (ug/L) | Total Samples | % Detected  | Average Detected (ug/L) | Total Samples | % Detected  | Average Detected (ug/L) |
| 1100000 Merrimack River Bl Concord River at Lowell, MA           | 4635                  | 15            | 13.3        | 0.00305                 | 15            | 0           |                         | 15            | 0           |                         | 15            | 0           |                         |
| 1102500 Aberjona River at Winchester, MA                         | 24.5                  | 16            | 6.3         | 0.003                   | 16            | 0           |                         | 16            | 0           |                         | 16            | 0           |                         |
| 1104615 Charles River above Watertown Dam at Watertown, MA       | 271                   | 64            | 71.9        | 0.008461                | 64            | 65.6        | 0.006571                | 64            | 34.4        | 0.005082                | 64            | 64.1        | 0.006339                |
| 1170100 Green River near Colrain, MA                             | 41.4                  | 2             | 0           |                         | 2             | 0           |                         | 2             | 0           |                         | 2             | 0           |                         |
| 1170970 Hatfield Reservoir near West Hatfield, Mass              | 0.87                  | 31            | 0           |                         | 31            | 0           |                         | 31            | 0           |                         | 31            | 0           |                         |
| <b>Michigan</b>  |                       | <b>142</b>    | <b>17.6</b> |                         | <b>142</b>    | <b>2.1</b>  |                         | <b>142</b>    | <b>2.8</b>  |                         | <b>142</b>    | <b>7.0</b>  |                         |
| 4161820 Clinton River at Sterling Heights, MI                    | 309                   | 103           | 24.3        | 0.004209                | 103           | 1.9         | 0.003805                | 103           | 2.9         | 1.332                   | 103           | 7.8         | 0.0041                  |
| 4175600 River Raisin near Manchester, MI                         | 132                   | 39            | 0           |                         | 39            | 2.6         | 0.0083                  | 39            | 2.6         | 0.0116                  | 39            | 5.1         | 0.00535                 |
| <b>Minnesota</b>   |                       | <b>367</b>    | <b>15.5</b> |                         | <b>367</b>    | <b>12.8</b> |                         | <b>367</b>    | <b>6.8</b>  |                         | <b>367</b>    | <b>21.5</b> |                         |
| 5288650 Mississippi River below I-694 at Fridley, MN             | 19500                 | 33            | 3.0         | 0.0059                  | 33            | 0           |                         | 33            | 0           |                         | 33            | 3.0         | 0.0034                  |
| 5288705 Shingle Creek at Queen Ave in Minneapolis, MN            | 28.2                  | 139           | 13.7        | 0.005101                | 139           | 21.6        | 0.005048                | 139           | 2.2         | 0.964233                | 139           | 41.7        | 0.004659                |
| 5299770 Florida Creek at 171 <sup>st</sup> Ave near Marietta, MN | 116                   | 10            | 0           |                         | 10            | 0           |                         | 10            | 0           |                         | 10            | 0           |                         |
| 5315295 Threemile Creek at 210 <sup>th</sup> Ave near Ghent, MN  | 62.6                  | 10            | 0           |                         | 10            | 0           |                         | 10            | 0           |                         | 10            | 0           |                         |
| 5320270 Little Cobb River near Beauford, MN                      | 130                   | 67            | 22.4        | 0.00748                 | 67            | 13.4        | 0.006456                | 67            | 9.0         | 0.0059                  | 67            | 19.4        | 0.005254                |
| 5320410 Maple River at Hwy 30 near Mapleton, MN                  | 195                   | 12            | 8.3         | 0.000758                | 12            | 8.3         | 0.000508                | 12            | 16.7        | 0.8259                  | 12            | 0           |                         |
| 5320500 Le Sueur River near Rapidan, MN                          | 1110                  | 12            | 0           |                         | 12            | 0           |                         | 12            | 8.3         | 0.7283                  | 12            | 0           |                         |
| 5325148 Sevenmile Ck Blw Footbridge in Park Nr Kasota, MN        | 36.3                  | 12            | 8.3         | 0.001492                | 12            | 0           |                         | 12            | 8.3         | 0.3716                  | 12            | 0           |                         |
| 5331580 Mississippi River Below L&D #2 at Hastings, MN           | 37100                 | 48            | 33.3        | 0.004439                | 48            | 8.3         | 0.004225                | 48            | 12.5        | 1.08645                 | 48            | 14.6        | 0.003971                |
| 5457200 Cedar River at 100 <sup>th</sup> St. near Lyle, MN       | 543                   | 12            | 33.3        | 0.001421                | 12            | 0           |                         | 12            | 25.0        | 1.141667                | 12            | 0           |                         |
| 531656290 West Fork Beaver Creek at 320 St. near Bechyn, MN      | 92.2                  | 12            | 0           |                         | 12            | 25.0        | 0.000507                | 12            | 25.0        | 0.613367                | 12            | 0           |                         |
| <b>Mississippi</b>   |                       | <b>412</b>    | <b>22.6</b> |                         | <b>412</b>    | <b>27.4</b> |                         | <b>412</b>    | <b>16.3</b> |                         | <b>412</b>    | <b>40.0</b> |                         |

| State/Sampling Station  | Water-shed Area (Mi <sup>2</sup> ) | Fipronil      |             |                         | Sulfide       |            |                         | Sulfone       |             |                         | Desulfinyl    |            |                         |
|---|------------------------------------|---------------|-------------|-------------------------|---------------|------------|-------------------------|---------------|-------------|-------------------------|---------------|------------|-------------------------|
|   |                                    | Total Samples | % Detected  | Average Detected (ug/L) | Total Samples | % Detected | Average Detected (ug/L) | Total Samples | % Detected  | Average Detected (ug/L) | Total Samples | % Detected | Average Detected (ug/L) |
| 7288650 Bogue Phalia Nr Leland, MS                            | 484                                | 122           | 23.0        | 0.008035                | 122           | 49.2       | 0.006739                | 122           | 33.6        | 0.109522                | 122           | 43.4       | 0.005232                |
| 7288955 Yazoo River Bl Steele Bayou Nr Long Lake, MS          | 13355                              | 203           | 20.7        | 0.00625                 | 203           | 24.6       | 0.006082                | 203           | 9.9         | 0.19337                 | 203           | 43.3       | 0.004595                |
| 3.22023e+14 Mississippi River above Vicksburg at Mile 438, MS | 1131145                            | 87            | 26.4        | 0.003714                | 87            | 3.4        | 0.006267                | 87            | 6.9         | 0.747517                | 87            | 27.6       | 0.004633                |
| <b>Missouri</b>   |                                    | <b>320</b>    | <b>17.8</b> |                         | <b>320</b>    | <b>7.2</b> |                         | <b>320</b>    | <b>14.7</b> |                         | <b>320</b>    | <b>9.1</b> |                         |
| 6893620 Rock Creek at Kentucky Road in Independence, MO       | 9.5                                | 12            | 33.3        | 0.001091                | 12            | 0          |                         | 12            | 66.7        | 0.907788                | 12            | 16.7       | 0.000771                |
| 6934500 Missouri River at Hermann, MO                         | 522500                             | 136           | 21.3        | 0.005315                | 136           | 5.1        | 0.004249                | 136           | 6.6         | 0.612878                | 136           | 7.4        | 0.0049                  |
| 7189000 Elk River Nr Tiff City, MO.                           | 872                                | 5             | 0           |                         | 5             | 0          |                         | 5             | 0           |                         | 5             | 20.0       | 0.0042                  |
| 3.83158e+14 North Moreau Creek Nr Jefferson City, MO          | 336                                | 12            | 8.3         | 0.002108                | 12            | 8.3        | 0.000254                | 12            | 16.7        | 0.90545                 | 12            | 8.3        | 0.001478                |
| 3.85638e+14 Loutre River near Montgomery City, MO             | 117                                | 12            | 8.3         | 0.000431                | 12            | 0          |                         | 12            | 0           |                         | 12            | 0          |                         |
| 3.902e+14 Moniteau Creek near Rocheport, MO                   | 126                                | 12            | 0           |                         | 12            | 0          |                         | 12            | 0           |                         | 12            | 0          |                         |
| 3.90227e+14 Perche Creek near Columbia, MO                    | 178                                | 11            | 0           |                         | 11            | 0          |                         | 11            | 0           |                         | 11            | 9.1        | 0.000404                |
| 3.91308e+14 Skull Lick Creek Nr Mexico, MO                    | 29.2                               | 12            | 0           |                         | 12            | 0          |                         | 12            | 0           |                         | 12            | 0          |                         |
| 3.91443e+14 Fish Branch near Mexico, MO                       | 17.3                               | 17            | 0           |                         | 17            | 0          |                         | 17            | 0           |                         | 17            | 0          |                         |
| 3.91504e+14 Bear Creek Nr Gilliam, MO                         | 8.14                               | 12            | 66.7        | 0.004505                | 12            | 50.0       | 0.000686                | 12            | 91.7        | 2.324191                | 12            | 50.0       | 0.002046                |
| 3.91815e+14 Goodwater Creek Nr Centralia, MO                  | 27.7                               | 19            | 5.3         | 0.0026                  | 19            | 0          |                         | 19            | 0           |                         | 19            | 0          |                         |
| 3.94151e+14 Contrary Creek Nr St. Joseph, MO                  | 26.3                               | 12            | 8.3         | 0.000575                | 12            | 0          |                         | 12            | 0           |                         | 12            | 0          |                         |
| 3.94254e+14 Brushy Creek near Cameron, MO                     | 36                                 | 12            | 91.7        | 0.008848                | 12            | 75.0       | 0.001969                | 12            | 91.7        | 5.621855                | 12            | 66.7       | 0.003997                |
| 4.00227e+14 Squaw Creek Ditch near Squaw Creek Wildlife Area  | -999                               | 12            | 0           |                         | 12            | 0          |                         | 12            | 50.0        | 1.1235                  | 12            | 0          |                         |
| 4.0024e+14 Little Fabius River Nr Fabius, MO                  | 34.8                               | 12            | 8.3         | 0.001603                | 12            | 0          |                         | 12            | 0           |                         | 12            | 0          |                         |
| 4.00502e+14 North Fabius River Nr Monticello, MO              | 453                                | 12            | 0           |                         | 12            | 0          |                         | 12            | 0           |                         | 12            | 0          |                         |
| <b>Montana</b>  |                                    | <b>76</b>     | <b>2.6</b>  |                         | <b>76</b>     | <b>0</b>   |                         | <b>76</b>     | <b>0</b>    |                         | <b>76</b>     | <b>0</b>   |                         |

| State/Sampling Station                                    | Water-shed Area (Mi²) | Fipronil      |             |                         | Sulfide       |             |                         | Sulfone       |             |                         | Desulfinyl    |             |                         |
|---|-----------------------|---------------|-------------|-------------------------|---------------|-------------|-------------------------|---------------|-------------|-------------------------|---------------|-------------|-------------------------|
|   |                       | Total Samples | % Detected  | Average Detected (ug/L) | Total Samples | % Detected  | Average Detected (ug/L) | Total Samples | % Detected  | Average Detected (ug/L) | Total Samples | % Detected  | Average Detected (ug/L) |
| 6295000 Yellowstone River at Forsyth MT                   | 40152                 | 19            | 0           |                         | 19            | 0           |                         | 19            | 0           |                         | 19            | 0           |                         |
| 6329500 Yellowstone River near Sidney MT                  | 69099                 | 57            | 3.5         | 0.001736                | 57            | 0           |                         | 57            | 0           |                         | 57            | 0           |                         |
| <b>Nebraska</b>   |                       | <b>622</b>    | <b>14.0</b> |                         | <b>622</b>    | <b>10.8</b> |                         | <b>622</b>    | <b>12.1</b> |                         | <b>622</b>    | <b>11.1</b> |                         |
| 6610000 Missouri River at Omaha, Nebr.                    | -999                  | 111           | 4.5         | 0.00756                 | 111           | 2.7         | 0.006                   | 111           | 3.6         | 0.0062                  | 111           | 0.9         | 0.0066                  |
| 6610765 Little Papillion Cr at Ak-Sar-Ben at Omaha, Nebr. | 50.2                  | 17            | 17.6        | 0.0047                  | 17            | 0           |                         | 17            | 17.6        | 1.626567                | 17            | 5.9         | 0.002309                |
| 6610785 West Papillion Creek at Millard, Nebr.            | 58.9                  | 12            | 66.7        | 0.004482                | 12            | 0           |                         | 12            | 41.7        | 2.04704                 | 12            | 33.3        | 0.002083                |
| 6795500 Shell Creek near Columbus, Nebr.                  | 294                   | 22            | 9.1         | 0.00685                 | 22            | 9.1         | 0.0041                  | 22            | 9.1         | 0.00605                 | 22            | 9.1         | 0.00355                 |
| 6799750 Tributary to South Fork Dry Creek, Nr Schuyler    | 0.57                  | 24            | 4.2         | 0.0089                  | 24            | 20.8        | 0.00414                 | 24            | 33.3        | 0.011663                | 24            | 12.5        | 0.004733                |
| 6800000 Maple Creek near Nickerson, Nebr.                 | 368                   | 169           | 11.8        | 0.01317                 | 169           | 13.6        | 0.005461                | 169           | 17.8        | 0.086617                | 169           | 4.7         | 0.005313                |
| 6800500 Elkhorn River at Waterloo, Nebr.                  | 6900                  | 78            | 7.7         | 0.009956                | 78            | 6.4         | 0.00556                 | 78            | 2.6         | 0.12225                 | 78            | 5.1         | 0.004375                |
| 6804000 Wahoo Creek at Ithaca, Nebr.                      | 273                   | 12            | 25.0        | 0.001323                | 12            | 0           |                         | 12            | 16.7        | 1.87485                 | 12            | 8.3         | 0.000306                |
| 6805500 Platte River at Louisville, Nebr.                 | 85370                 | 129           | 30.2        | 0.00609                 | 129           | 22.5        | 0.005294                | 129           | 14.7        | 0.051                   | 129           | 34.9        | 0.004616                |
| 4.01143e+14 Turkey Creek near Steinauer, Nebr.            | 61.5                  | 12            | 0           |                         | 12            | 0           |                         | 12            | 0           |                         | 12            | 0           |                         |
| 4.13012e+14 Bell Creek near Arlington, Nebr.              | 167                   | 12            | 0           |                         | 12            | 0           |                         | 12            | 0           |                         | 12            | 0           |                         |
| 4.20444e+14 Elkhorn River near Oakdale, Nebr.             | 2451                  | 12            | 0           |                         | 12            | 0           |                         | 12            | 0           |                         | 12            | 0           |                         |
| 4.24048e+14 Howe Creek near Lindy, Nebr.                  | 56                    | 12            | 0           |                         | 12            | 0           |                         | 12            | 0           |                         | 12            | 0           |                         |
| <b>Nevada</b>   |                       | <b>210</b>    | <b>9.5</b>  |                         | <b>210</b>    | <b>6.2</b>  |                         | <b>210</b>    | <b>1.4</b>  |                         | <b>210</b>    | <b>26.2</b> |                         |
| 10311400 Carson Rv at Deer Run Rd Nr Carson City, NV      | 958                   | 18            | 5.6         | 0.0026                  | 18            | 5.6         | 0.0072                  | 18            | 5.6         | 0.0075                  | 18            | 0           |                         |
| 10350340 Truckee Rv Nr Tracy, NV                          | 1580                  | 70            | 8.6         | 0.003282                | 70            | 4.3         | 0.011067                | 70            | 2.9         | 1.16895                 | 70            | 7.1         | 0.00504                 |
| 10350500 Truckee Rv at Clark, NV                          | 1600                  | 34            | 5.9         | 0.00635                 | 34            | 0           |                         | 34            | 0           |                         | 34            | 2.9         | 0.0048                  |
| 94196783 Lv Wash Blw Flamingo Wash Confl Nr Las Vegas, NV | 1369                  | 88            | 12.5        | 0.004682                | 88            | 10.2        | 0.004244                | 88            | 0           |                         | 88            | 55.7        | 0.004945                |
| <b>New Jersey</b>   |                       | <b>352</b>    | <b>61.4</b> |                         | <b>352</b>    | <b>45.5</b> |                         | <b>352</b>    | <b>28.4</b> |                         | <b>352</b>    | <b>56.8</b> |                         |

| State/Sampling Station                                   | Water-shed Area (Mi²) | Fipronil      |             |                         | Sulfide       |             |                         | Sulfone       |             |                         | Desulfinyl    |             |                         |
|--|-----------------------|---------------|-------------|-------------------------|---------------|-------------|-------------------------|---------------|-------------|-------------------------|---------------|-------------|-------------------------|
|  |                       | Total Samples | % Detected  | Average Detected (ug/L) | Total Samples | % Detected  | Average Detected (ug/L) | Total Samples | % Detected  | Average Detected (ug/L) | Total Samples | % Detected  | Average Detected (ug/L) |
| 1403300 Raritan River at Queens Bridge at Bound Brook NJ | 804                   | 151           | 90.7        | 0.013051                | 151           | 80.8        | 0.005989                | 151           | 47.7        | 0.0064                  | 151           | 86.8        | 0.005564                |
| 1403900 Bound Brook at Middlesex NJ                      | 48.4                  | 53            | 83.0        | 0.012591                | 53            | 69.8        | 0.007003                | 53            | 45.3        | 0.006429                | 53            | 75.5        | 0.006125                |
| 1411500 Maurice River at Norma NJ                        | 112                   | 2             | 0           |                         | 2             | 0           |                         | 2             | 0           |                         | 2             | 0           |                         |
| 1463500 Delaware River at Trenton NJ                     | 6780                  | 146           | 24.0        | 0.004326                | 146           | 0.7         | 0.0034                  | 146           | 2.7         | 0.54475                 | 146           | 19.9        | 0.004445                |
| <b>New York</b>  |                       | <b>170</b>    | <b>3.5</b>  |                         | <b>170</b>    | <b>0</b>    |                         | <b>170</b>    | <b>0</b>    |                         | <b>170</b>    | <b>4.7</b>  |                         |
| 1349150 Canajoharie Creek near Canajoharie NY            | 59.7                  | 67            | 0           |                         | 67            | 0           |                         | 67            | 0           |                         | 67            | 3.0         | 0.00455                 |
| 1356190 Lisha Kill Northwest of Niskayuna NY             | 15.6                  | 49            | 0           |                         | 49            | 0           |                         | 49            | 0           |                         | 49            | 6.1         | 0.004767                |
| 1357500 Mohawk River at Cohoes NY                        | 3450                  | 42            | 11.9        | 0.00948                 | 42            | 0           |                         | 42            | 0           |                         | 42            | 4.8         | 0.00565                 |
| 1374987 Kisco River Below Mount Kisco NY                 | 17.6                  | 1             | 100.0       | 0.0064                  | 1             | 0           |                         | 1             | 0           |                         | 1             | 100.0       | 0.0035                  |
| 4264331 St. Lawrence R at Cornwall Ont Nr Massena NY     | 298800                | 11            | 0           |                         | 11            | 0           |                         | 11            | 0           |                         | 11            | 0           |                         |
| <b>North Carolina</b>                                    |                       | <b>624</b>    | <b>70.8</b> |                         | <b>624</b>    | <b>62.8</b> |                         | <b>624</b>    | <b>47.0</b> |                         | <b>624</b>    | <b>57.7</b> |                         |
| 2081190 Tar River Nr Berea, NC                           | 26.8                  | 2             | 0           |                         | 2             | 0           |                         | 2             | 0           |                         | 2             | 0           |                         |
| 2081510 Foundry Branch at Mouth near Oxford, NC          | 4.85                  | 1             | 100.0       | 0.0131                  | 1             | 100.0       | 0.0071                  | 1             | 0           |                         | 1             | 0           |                         |
| 2081511 Fishing Creek Nr Oxford, NC                      | 6.65                  | 1             | 100.0       | 0.021                   | 1             | 0           |                         | 1             | 0           |                         | 1             | 0           |                         |
| 2084160 Chicod Cr at SR1760 near Simpson, NC             | 45                    | 24            | 16.7        | 0.008275                | 24            | 12.5        | 0.0038                  | 24            | 0           |                         | 24            | 8.3         | 0.00545                 |
| 2085430 Deep Creek near Moriah, NC                       | 31.85                 | 2             | 0           |                         | 2             | 0           |                         | 2             | 0           |                         | 2             | 0           |                         |
| 2086849 Ellerbe Creek near Gorman, NC                    | 21.9                  | 8             | 100.0       | 0.024492                | 8             | 100.0       | 0.00354                 | 8             | 100.0       | 6.468488                | 8             | 75.0        | 0.002315                |
| 2087580 Swift Creek near Apex, NC                        | 21                    | 163           | 91.4        | 0.014434                | 163           | 91.4        | 0.007277                | 163           | 91.4        | 1.751874                | 163           | 90.8        | 0.006742                |
| 2089500 Neuse River at Kinston, NC                       | 2692                  | 177           | 81.9        | 0.008628                | 177           | 73.4        | 0.005806                | 177           | 49.7        | 0.364036                | 177           | 74.6        | 0.005901                |
| 2091500 Contentnea Creek at Hookerton, NC                | 733                   | 125           | 44.0        | 0.005906                | 125           | 45.6        | 0.005338                | 125           | 20.8        | 0.422062                | 125           | 32.0        | 0.004673                |
| 2097355 Bolin Creek Ab Franklin St near Chapel Hill, NC  | 10.45                 | 3             | 100.0       | 0.011767                | 3             | 66.7        | 0.00445                 | 3             | 66.7        | 0.0067                  | 3             | 66.7        | 0.00305                 |
| 2097464 Morgan Creek near White                          | 8.35                  | 10            | 30.0        | 0.002775                | 10            | 0           |                         | 10            | 10.0        | 0.005                   | 10            | 0           |                         |

| State/Sampling Station                                      | Water-shed Area (Mi²) | Fipronil      |            |                         | Sulfide       |            |                         | Sulfone       |            |                         | Desulfinyl    |            |                         |
|---|-----------------------|---------------|------------|-------------------------|---------------|------------|-------------------------|---------------|------------|-------------------------|---------------|------------|-------------------------|
|   |                       | Total Samples | % Detected | Average Detected (ug/L) | Total Samples | % Detected | Average Detected (ug/L) | Total Samples | % Detected | Average Detected (ug/L) | Total Samples | % Detected | Average Detected (ug/L) |
| Cross, NC   |                       |               |            |                         |               |            |                         |               |            |                         |               |            |                         |
| 2099238 Bull Run at NC 29/70 Nr Jamestown, NC               | 6.93                  | 2             | 100.0      | 0.0058                  | 2             | 0          |                         | 2             | 0          |                         | 2             | 0          |                         |
| 2099480 Richland Creek Nr Archdale, NC                      | 12.62                 | 2             | 0          |                         | 2             | 0          |                         | 2             | 0          |                         | 2             | 0          |                         |
| 2100295 Hasketts Cr below SR2149 near Central Falls, NC     | 11.75                 | 2             | 100.0      | 0.01225                 | 2             | 50.0       | 0.0044                  | 2             | 50.0       | 0.005                   | 2             | 50.0       | 0.003                   |
| 2100634 Vestal Creek Nr Asheboro, NC                        | 6.35                  | 2             | 100.0      | 0.0053                  | 2             | 0          |                         | 2             | 0          |                         | 2             | 0          |                         |
| 208500600 Cates Creek Nr Hillsborough, NC                   | 4.2                   | 6             | 0          |                         | 6             | 0          |                         | 6             | 0          |                         | 6             | 0          |                         |
| 208501535 Strouds Cr at St Marys Rd Nr Hillsborough, NC     | 8.94                  | 1             | 0          |                         | 1             | 0          |                         | 1             | 0          |                         | 1             | 0          |                         |
| 208725055 Black Cr at Weston Parkway Nr Cary, NC            | 3.47                  | 6             | 83.3       | 0.01398                 | 6             | 66.7       | 0.005275                | 6             | 33.3       | 0.0069                  | 6             | 16.7       | 0.0028                  |
| 208726370 Richlands Creek at Schenk Forest Nr Cary, NC      | 4.34                  | 6             | 50.0       | 0.0084                  | 6             | 33.3       | 0.00455                 | 6             | 16.7       | 0.006                   | 6             | 16.7       | 0.0034                  |
| 208726995 Hare Snipe Creek at SR 1822 Nr Leesville, NC      | 6.18                  | 6             | 100.0      | 0.012133                | 6             | 83.3       | 0.00382                 | 6             | 16.7       | 0.0059                  | 6             | 83.3       | 0.00338                 |
| 208730725 Beaverdm Creek at Glenwood Avenue at Raleigh, NC  | 3.21                  | 6             | 83.3       | 0.01036                 | 6             | 83.3       | 0.00426                 | 6             | 16.7       | 0.0072                  | 6             | 16.7       | 0.0035                  |
| 208732610 Pigeon House Br at Crabtree Blvd at Raleigh, NC   | 4.39                  | 6             | 50.0       | 0.008                   | 6             | 0          |                         | 6             | 0          |                         | 6             | 0          |                         |
| 208755215 Neuse R Ab US 70 at Smithfield, NC                | 1200                  | 30            | 90.0       | 0.015022                | 30            | 56.7       | 0.006888                | 30            | 26.7       | 0.008975                | 30            | 53.3       | 0.006113                |
| 208758440 Dutchmans Br at SR 1386 Nr McCullers Crossrds, NC | 4.53                  | 2             | 100.0      | 0.0096                  | 2             | 100.0      | 0.0025                  | 2             | 50.0       | 0.0027                  | 2             | 50.0       | 0.0011                  |
| 208794025 Camp Branch Ab SR 1390 Nr Holly Springs, NC       | 2.14                  | 3             | 100.0      | 0.007333                | 3             | 33.3       | 0.0044                  | 3             | 33.3       | 0.0048                  | 3             | 0          |                         |
| 208794555 Camp Branch at SR 1390 Nr Holly Springs, NC       | 3.13                  | 3             | 66.7       | 0.0066                  | 3             | 33.3       | 0.001                   | 3             | 0          |                         | 3             | 0          |                         |
| 209517912 N Buffalo Creek at Greensboro, NC                 | 4.78                  | 2             | 100.0      | 0.01045                 | 2             | 50.0       | 0.0045                  | 2             | 0          |                         | 2             | 100.0      | 0.0033                  |
| 209647280 Service Creek above Dry Creek at Burlington, NC   | 4.92                  | 2             | 0          |                         | 2             | 0          |                         | 2             | 0          |                         | 2             | 0          |                         |
| 209647295 Dry Cr above Service Creek at Burlington, NC      | 2.51                  | 2             | 50.0       | 0.0078                  | 2             | 0          |                         | 2             | 0          |                         | 2             | 0          |                         |
| 209651815 Branch Creek at NC 54 Nr Graham, NC               | 1.9                   | 2             | 50.0       | 0.007                   | 2             | 0          |                         | 2             | 0          |                         | 2             | 0          |                         |
| 209665940 Rock Cr Trib at Stoney                            | 4.5                   | 2             | 0          |                         | 2             | 0          |                         | 2             | 0          |                         | 2             | 0          |                         |

| State/Sampling Station  | Water-shed Area (Mi²) | Fipronil      |             |                         | Sulfide       |             |                         | Sulfone       |             |                         | Desulfinyl    |             |                         |
|---|-----------------------|---------------|-------------|-------------------------|---------------|-------------|-------------------------|---------------|-------------|-------------------------|---------------|-------------|-------------------------|
|   |                       | Total Samples | % Detected  | Average Detected (ug/L) | Total Samples | % Detected  | Average Detected (ug/L) | Total Samples | % Detected  | Average Detected (ug/L) | Total Samples | % Detected  | Average Detected (ug/L) |
| Cr Golf Crse Nr Sedalia, NC                                   |                       |               |             |                         |               |             |                         |               |             |                         |               |             |                         |
| 209665990 Rock Cr Above Rock Cr Trib Nr Whitsett, NC          | 10.03                 | 2             | 0           |                         | 2             | 0           |                         | 2             | 0           |                         | 2             | 0           |                         |
| 209679804 Little Alamance Cr at SR 2309 Nr Graham, NC         | 14.42                 | 2             | 100.0       | 0.0089                  | 2             | 50.0        | 0.0039                  | 2             | 50.0        | 0.0067                  | 2             | 0           |                         |
| 209695780 Brooks Cr at Eddie Perry Rd Nr Bynum, NC            | 9.22                  | 2             | 0           |                         | 2             | 0           |                         | 2             | 0           |                         | 2             | 0           |                         |
| 209697900 Pokeberry Creek Nr Pittsboro, NC                    | 11.5                  | 2             | 0           |                         | 2             | 0           |                         | 2             | 0           |                         | 2             | 0           |                         |
| 209737400 Bolin Cr at US 15-501 Nr Chapel Hill, NC            | 11.51                 | 3             | 100.0       | 0.018                   | 3             | 33.3        | 0.0019                  | 3             | 33.3        | 0.0054                  | 3             | 0           |                         |
| 209750881 Wilson Cr at Mouth Nr Chapel Hill, NC               | 3.54                  | 2             | 100.0       | 0.00615                 | 2             | 50.0        | 0.0045                  | 2             | 50.0        | 0.0065                  | 2             | 100.0       | 0.0022                  |
| 211583580 Bowen Branch Nr Mouth at Winston-Salem, NC          | 1.94                  | 2             | 0           |                         | 2             | 0           |                         | 2             | 0           |                         | 2             | 0           |                         |
| <b>North Dakota</b>   |                       | <b>20</b>     | <b>5.0</b>  |                         | <b>20</b>     | <b>0</b>    |                         | <b>20</b>     | <b>0</b>    |                         | <b>20</b>     | <b>0</b>    |                         |
| 5082500 Red River of the North at Grand Forks, ND             | 30100                 | 20            | 5.0         | 0.000969                | 20            | 0           |                         | 20            | 0           |                         | 20            | 0           |                         |
| <b>Ohio</b>   |                       | <b>365</b>    | <b>41.1</b> |                         | <b>365</b>    | <b>22.5</b> |                         | <b>365</b>    | <b>14.2</b> |                         | <b>365</b>    | <b>29.9</b> |                         |
| 3241500 Massies Creek at Wilberforce OH                       | 63.2                  | 12            | 0           |                         | 12            | 0           |                         | 12            | 0           |                         | 12            | 0           |                         |
| 3259000 Mill Creek at Carthage OH                             | 115                   | 12            | 100.0       | 0.014898                | 12            | 91.7        | 0.001569                | 12            | 100.0       | 4.822217                | 12            | 91.7        | 0.003141                |
| 3267900 Mad River at St Paris Pike at Eagle City OH           | 310                   | 48            | 10.4        | 0.00342                 | 48            | 0           |                         | 48            | 0           |                         | 48            | 2.1         | 0.0046                  |
| 3271000 Wolf Creek at Dayton OH                               | 68.7                  | 12            | 58.3        | 0.00098                 | 12            | 16.7        | 0.000458                | 12            | 16.7        | 0.78415                 | 12            | 16.7        | 0.000326                |
| 4178000 St Joseph River near Newville IN                      | 610                   | 17            | 5.9         | 0.0034                  | 17            | 0           |                         | 17            | 0           |                         | 17            | 0           |                         |
| 4186500 Auglaize River near Fort Jennings OH                  | 332                   | 89            | 59.6        | 0.00823                 | 89            | 41.6        | 0.005854                | 89            | 19.1        | 0.0054                  | 89            | 61.8        | 0.005085                |
| 4193500 Maumee River at Waterville OH                         | 6330                  | 102           | 45.1        | 0.006046                | 102           | 27.5        | 0.006554                | 102           | 17.6        | 0.279544                | 102           | 33.3        | 0.00508                 |
| 3.93944e+14 Holes Ck in Huffman Park at Kettering, OH         | 19                    | 25            | 84.0        | 0.013219                | 25            | 16.0        | 0.004375                | 25            | 12.0        | 0.005367                | 25            | 24.0        | 0.003983                |
| 3.95942e+14 Big Darby Creek at Prairie Oaks Nr Lake Darby, OH | 229                   | 12            | 16.7        | 0.000527                | 12            | 0           |                         | 12            | 0           |                         | 12            | 0           |                         |
| 4.10133e+14 Unnamed Trib to Honey Creek near Willard, OH      | 10.4                  | 12            | 0           |                         | 12            | 0           |                         | 12            | 0           |                         | 12            | 0           |                         |
| 4.1015e+14 Sandusky River at CR6 near McClutchenville, OH     | 771                   | 12            | 25.0        | 0.00103                 | 12            | 0           |                         | 12            | 0           |                         | 12            | 0           |                         |

| State/Sampling Station  | Water-shed Area (Mi²) | Fipronil      |             |                         | Sulfide       |             |                         | Sulfone       |             |                         | Desulfinyl    |             |                         |
|---|-----------------------|---------------|-------------|-------------------------|---------------|-------------|-------------------------|---------------|-------------|-------------------------|---------------|-------------|-------------------------|
|   |                       | Total Samples | % Detected  | Average Detected (ug/L) | Total Samples | % Detected  | Average Detected (ug/L) | Total Samples | % Detected  | Average Detected (ug/L) | Total Samples | % Detected  | Average Detected (ug/L) |
| 4.11146e+14 Vermilion River at SR18 near Clarksfield, OH            | 130                   | 12            | 0           |                         | 12            | 0           |                         | 12            | 0           |                         | 12            | 0           |                         |
| <b>Oklahoma</b>   |                       | <b>26</b>     |             |                         | <b>26</b>     | <b>53.8</b> |                         | <b>26</b>     | <b>88.5</b> |                         | <b>26</b>     | <b>61.5</b> |                         |
| 7241550 North Canadian River near Harrah, OK                        | 13775                 | 26            | 100.0       | 0.011351                | 26            | 53.8        | 0.001206                | 26            | 88.5        | 3.199635                | 26            | 61.5        | 0.002406                |
| <b>Oregon</b>   |                       | <b>668</b>    | <b>17.7</b> |                         | <b>668</b>    | <b>11.1</b> |                         | <b>668</b>    | <b>6.6</b>  |                         | <b>668</b>    | <b>14.7</b> |                         |
| 14199710 Nate Creek near Colton, Oreg.                              | 11.1                  | 2             | 0           |                         | 2             | 0           |                         | 2             | 0           |                         | 2             | 0           |                         |
| 14201300 Zollner Creek near Mt Angel, OR                            | 15                    | 123           | 2.4         | 0.006933                | 123           | 1.6         | 0.00505                 | 123           | 0.8         | 0.2047                  | 123           | 0.8         | 0.003                   |
| 14205400 East Fork Dairy Creek near Meacham Corner, OR              | 33.8                  | 9             | 0           |                         | 9             | 0           |                         | 9             | 0           |                         | 9             | 0           |                         |
| 14206347 Rock Creek at Quatama Road near Hillsboro, OR              | 25.8                  | 2             | 0           |                         | 2             | 0           |                         | 2             | 0           |                         | 2             | 0           |                         |
| 14206435 Beaverton Creek at SW 216 <sup>th</sup> Ave, Nr Orenco, OR | 36.9                  | 2             | 0           |                         | 2             | 0           |                         | 2             | 0           |                         | 2             | 0           |                         |
| 14206750 Chicken Creek near Sherwood, OR                            | 15.5                  | 2             | 0           |                         | 2             | 0           |                         | 2             | 0           |                         | 2             | 0           |                         |
| 14206950 Fanno Creek at Durham, OR                                  | 31.5                  | 145           | 55.9        | 0.013143                | 145           | 49.7        | 0.005494                | 145           | 29.0        | 0.922081                | 145           | 55.2        | 0.005048                |
| 14211315 Tryon Creek near Lake Oswego, OR                           | 6.28                  | 2             | 100.0       | 0.0049                  | 2             | 0           |                         | 2             | 0           |                         | 2             | 0           |                         |
| 14211720 Willamette River at Portland, OR                           | 11200                 | 195           | 15.9        | 0.004101                | 195           | 0           |                         | 195           | 0           |                         | 195           | 8.2         | 0.004413                |
| 14246900 Columbia River @ Beaver Army Terminal Nr Quincy, OR        | 256900                | 125           | 0           |                         | 125           | 0           |                         | 125           | 0           |                         | 125           | 0           |                         |
| 4.34745e+14 Silk Creek near Cottage Grove, OR                       | 16.3                  | 2             | 0           |                         | 2             | 0           |                         | 2             | 0           |                         | 2             | 0           |                         |
| 4.35212e+14 Lost Creek near Dexter, OR                              | 32.2                  | 2             | 0           |                         | 2             | 0           |                         | 2             | 0           |                         | 2             | 0           |                         |
| 4.40257e+14 Amazon Creek near Danebo Road at Eugene, OR             | 19.4                  | 2             | 0           |                         | 2             | 0           |                         | 2             | 0           |                         | 2             | 0           |                         |
| 4.43326e+14 Oak Creek at Corvallis, OR                              | 12.6                  | 2             | 0           |                         | 2             | 0           |                         | 2             | 0           |                         | 2             | 0           |                         |
| 4.45029e+14 Battle Creek near Turner, OR                            | 11.6                  | 2             | 0           |                         | 2             | 0           |                         | 2             | 0           |                         | 2             | 0           |                         |
| 4.45551e+14 Pringle Creek at Salem, OR                              | 9.6                   | 6             | 0           |                         | 6             | 0           |                         | 6             | 0           |                         | 6             | 16.7        | 0.0065                  |
| 4.50022e+14 Claggett Creek at                                       | 9.6                   | 6             | 0           |                         | 6             | 0           |                         | 6             | 0           |                         | 6             | 0           |                         |

| State/Sampling Station                                    | Water-shed Area (Mi²) | Fipronil      |             |                         | Sulfide       |             |                         | Sulfone       |             |                         | Desulfinyl    |             |                         |
|---|-----------------------|---------------|-------------|-------------------------|---------------|-------------|-------------------------|---------------|-------------|-------------------------|---------------|-------------|-------------------------|
|   |                       | Total Samples | % Detected  | Average Detected (ug/L) | Total Samples | % Detected  | Average Detected (ug/L) | Total Samples | % Detected  | Average Detected (ug/L) | Total Samples | % Detected  | Average Detected (ug/L) |
| Keizer, OR  |                       |               |             |                         |               |             |                         |               |             |                         |               |             |                         |
| 4.50955e+14 Milk Creek at Camp Adams                      | 40.1                  | 2             | 0           |                         | 2             | 0           |                         | 2             | 0           |                         | 2             | 0           |                         |
| 4.51734e+14 Chehalem Creek at Newberg, OR                 | 37.8                  | 2             | 0           |                         | 2             | 0           |                         | 2             | 0           |                         | 2             | 0           |                         |
| 4.52149e+14 North Yamhill Creek near Yamhill, OR          | 25.4                  | 2             | 0           |                         | 2             | 0           |                         | 2             | 0           |                         | 2             | 0           |                         |
| 4.52231e+14 Deep Creek near Sandy, OR                     | 12.1                  | 6             | 0           |                         | 6             | 0           |                         | 6             | 0           |                         | 6             | 0           |                         |
| 4.52337e+14 North Fork Deep Creek at Barton, OR           | 14.3                  | 6             | 0           |                         | 6             | 0           |                         | 6             | 0           |                         | 6             | 0           |                         |
| 4.52414e+14 Tickle Creek near Boring, OR                  | 13.2                  | 7             | 0           |                         | 7             | 0           |                         | 7             | 0           |                         | 7             | 0           |                         |
| 4.52526e+14 Kellogg Creek at Milwaukie, OR                | 13.2                  | 7             | 0           |                         | 7             | 0           |                         | 7             | 0           |                         | 7             | 0           |                         |
| 4.52912e+14 Johnson Creek at Circle Ave, OR               | 21.5                  | 3             | 33.3        | 0.001892                | 3             | 0           |                         | 3             | 33.3        | 2.078                   | 3             | 0           |                         |
| 4.53506e+14 Iler Creek near Forest Grove, OR              | 4.9                   | 2             | 0           |                         | 2             | 0           |                         | 2             | 0           |                         | 2             | 0           |                         |
| 4.54543e+14 South Scappose Creek at Scappose, OR          | 25.2                  | 2             | 0           |                         | 2             | 0           |                         | 2             | 0           |                         | 2             | 0           |                         |
| <b>Pennsylvania</b>                                       |                       | <b>108</b>    | <b>43.5</b> |                         | <b>108</b>    | <b>20.4</b> |                         | <b>108</b>    | <b>18.5</b> |                         | <b>108</b>    | <b>28.7</b> |                         |
| 1464907 Little Neshaminy C at Valley Road Nr Neshaminy PA | 26.81                 | 35            | 85.7        | 0.025153                | 35            | 54.3        | 0.007526                | 35            | 48.6        | 0.010518                | 35            | 62.9        | 0.011068                |
| 1472157 French Creek near Phoenixville, PA                | 59.1                  | 35            | 22.9        | 0.006463                | 35            | 8.6         | 0.005467                | 35            | 2.9         | 0.0066                  | 35            | 5.7         | 0.0045                  |
| 1474500 Schuylkill River at Philadelphia, PA              | 1893                  | 16            | 43.8        | 0.007343                | 16            | 0           |                         | 16            | 6.3         | 0.0032                  | 16            | 12.5        | 0.00385                 |
| 1567000 Juniata River at Newport, PA                      | 3354                  | 1             | 0           |                         | 1             | 0           |                         | 1             | 0           |                         | 1             | 0           |                         |
| 1570500 Susquehanna River at Harrisburg, PA               | 24100                 | 21            | 9.5         | 0.0045                  | 21            | 0           |                         | 21            | 4.8         | 0.0015                  | 21            | 23.8        | 0.00178                 |
| <b>South Carolina</b>                                     |                       | <b>263</b>    | <b>23.2</b> |                         | <b>263</b>    | <b>25.1</b> |                         | <b>263</b>    | <b>9.5</b>  |                         | <b>263</b>    | <b>28.9</b> |                         |
| 2169570 Gills Creek at Columbia, SC                       | 59.6                  | 58            | 58.6        | 0.010335                | 58            | 67.2        | 0.006846                | 58            | 31.0        | 0.006794                | 58            | 67.2        | 0.006303                |
| 2172062 Cw-7 Back R below Foster Ck at Hwy5(8-503)        | 15077                 | 28            | 21.4        | 0.006567                | 28            | 57.1        | 0.007006                | 28            | 7.1         | 0.00585                 | 28            | 71.4        | 0.005075                |
| 2172300 McTier Creek (Rd 209) near Monetta, SC            | 15.6                  | 3             | 0           |                         | 3             | 0           |                         | 3             | 0           |                         | 3             | 0           |                         |
| 2174250 Cow Castle Creek near                             | 23.4                  | 73            | 20.5        | 0.007587                | 73            | 13.7        | 0.00709                 | 73            | 5.5         | 0.00665                 | 73            | 20.5        | 0.00526                 |

| State/Sampling Station                                   | Water-shed Area (Mi²) | Fipronil      |             |                         | Sulfide       |             |                         | Sulfone       |             |                         | Desulfinyln   |             |                         |
|--|-----------------------|---------------|-------------|-------------------------|---------------|-------------|-------------------------|---------------|-------------|-------------------------|---------------|-------------|-------------------------|
|  |                       | Total Samples | % Detected  | Average Detected (ug/L) | Total Samples | % Detected  | Average Detected (ug/L) | Total Samples | % Detected  | Average Detected (ug/L) | Total Samples | % Detected  | Average Detected (ug/L) |
| Bowman, SC   |                       |               |             |                         |               |             |                         |               |             |                         |               |             |                         |
| 2175000 Edisto River Nr Givhans, SC                      | 2730                  | 101           | 5.9         | 0.00485                 | 101           | 1.0         | 0.0099                  | 101           | 1.0         | 0.0148                  | 101           | 2.0         | 0.00425                 |
| <b>South Dakota</b>                                      |                       | <b>6</b>      | <b>0</b>    |                         | <b>6</b>      | <b>0</b>    |                         | <b>6</b>      | <b>16.7</b> |                         | <b>6</b>      | <b>0</b>    |                         |
| 4.3542e+14 Pipestone Creek Nr SD/MN State Line           | -999                  | 6             | 0           |                         | 6             | 0           |                         | 6             | 16.7        | 1.1209                  | 6             | 0           |                         |
| <b>Tennessee</b>   |                       | <b>118</b>    | <b>13.6</b> |                         | <b>118</b>    | <b>3.4</b>  |                         | <b>118</b>    | <b>4.2</b>  |                         | <b>118</b>    | <b>14.4</b> |                         |
| 3466208 Big Limestone Creek near Limestone, TN           | 79                    | 63            | 9.5         | 0.005267                | 63            | 0           |                         | 63            | 0           |                         | 63            | 6.3         | 0.00515                 |
| 3467609 Nolichucky River near Lowland                    | 1688.4                | 38            | 5.3         | 0.00455                 | 38            | 0           |                         | 38            | 0           |                         | 38            | 21.1        | 0.006275                |
| 7031692 Fletcher Creek at Sycamore View Road at Memphis  | 30.5                  | 17            | 47.1        | 0.064038                | 17            | 23.5        | 0.0085                  | 17            | 29.4        | 0.0194                  | 17            | 29.4        | 0.01108                 |
| <b>Texas</b>   |                       | <b>884</b>    | <b>42.6</b> |                         | <b>884</b>    | <b>36.5</b> |                         | <b>884</b>    | <b>28.6</b> |                         | <b>884</b>    | <b>48.8</b> |                         |
| 8049490 Johnson Ck Nr Duncan Perry Rd, Grand Prairie, TX | 17                    | 1             | 100.0       | 0.0046                  | 1             | 100.0       | 0.0021                  | 1             | 100.0       | 0.0026                  | 1             | 100.0       | 0.0023                  |
| 8049580 Mountain Ck Nr Venus, TX                         | 25.5                  | 2             | 0           |                         | 2             | 0           |                         | 2             | 0           |                         | 2             | 0           |                         |
| 8049955 Fish Ck at Belt Line Rd, Grand Prairie, TX       | 25.9                  | 2             | 100.0       | 0.00715                 | 2             | 50.0        | 0.0021                  | 2             | 50.0        | 0.0027                  | 2             | 100.0       | 0.00305                 |
| 8051500 Clear Ck Nr Sanger, TX                           | 295                   | 19            | 0           |                         | 19            | 5.3         | 0.0013                  | 19            | 0           |                         | 19            | 5.3         | 0.0044                  |
| 8052740 Doe Br at Fishtrap Rd Nr Prosper, TX             | 29.5                  | 5             | 0           |                         | 5             | 0           |                         | 5             | 0           |                         | 5             | 0           |                         |
| 8055500 Elm Fk Trinity Rv Nr Carrollton, TX              | 2459                  | 30            | 40.0        | 0.006825                | 30            | 10.0        | 0.005267                | 30            | 6.7         | 0.00415                 | 30            | 33.3        | 0.00446                 |
| 8057200 White Rk Ck at Greenville Ave, Dallas, TX        | 66.4                  | 141           | 93.6        | 0.019527                | 141           | 75.2        | 0.006509                | 141           | 84.4        | 2.472971                | 141           | 89.4        | 0.009258                |
| 8057410 Trinity Rv Bl Dallas, TX                         | 6278                  | 174           | 81.6        | 0.014556                | 174           | 79.3        | 0.005649                | 174           | 44.8        | 0.632818                | 174           | 79.3        | 0.005821                |
| 8057431 Fivemile Ck Nr Simpson Stuart Rd, Dallas, TX     | 38.9                  | 6             | 50.0        | 0.006967                | 6             | 0           |                         | 6             | 16.7        | 0.0071                  | 6             | 33.3        | 0.00325                 |
| 8057475 Parsons Sl Nr Davis Rd Nr Crandall, TX           | 43.9                  | 6             | 16.7        | 0.0078                  | 6             | 16.7        | 0.0025                  | 6             | 0           |                         | 6             | 33.3        | 0.004                   |
| 8059530 Tickey Ck Nr CR 400 Nr Princeton, TX             | 10.1                  | 1             | 0           |                         | 1             | 0           |                         | 1             | 0           |                         | 1             | 0           |                         |
| 8059571 Wilson Ck Nr Gray Br Rd Nr McKinney, TX          | 31.1                  | 2             | 0           |                         | 2             | 0           |                         | 2             | 0           |                         | 2             | 0           |                         |
| 8061536 Spring Ck at Naaman School Rd Nr Garland, TX     | 35.1                  | 2             | 100.0       | 0.0113                  | 2             | 100.0       | 0.00385                 | 2             | 100.0       | 0.0083                  | 2             | 100.0       | 0.00625                 |
| 8061740 Duck Ck at Twn East                              | 40.9                  | 2             | 100.0       | 0.0326                  | 2             | 100.0       | 0.002                   | 2             | 0           |                         | 2             | 100.0       | 0.0025                  |

| State/Sampling Station                             | Water-shed Area (Mi²) | Fipronil      |            |                         | Sulfide       |            |                         | Sulfone       |            |                         | Desulfinyl    |            |                         |
|--|-----------------------|---------------|------------|-------------------------|---------------|------------|-------------------------|---------------|------------|-------------------------|---------------|------------|-------------------------|
|  |                       | Total Samples | % Detected | Average Detected (ug/L) | Total Samples | % Detected | Average Detected (ug/L) | Total Samples | % Detected | Average Detected (ug/L) | Total Samples | % Detected | Average Detected (ug/L) |
| Blvd Nr Mesquite, TX                               |                       |               |            |                         |               |            |                         |               |            |                         |               |            |                         |
| 8061780 Buffalo Ck Nr Trinity Rd at Forney, TX     | 32.6                  | 6             | 50.0       | 0.0142                  | 6             | 50.0       | 0.0048                  | 6             | 16.7       | 0.0074                  | 6             | 33.3       | 0.00425                 |
| 8061952 S Mesquite Ck at Lawson Rd Nr Mesquite, TX | 25                    | 2             | 100.0      | 0.0087                  | 2             | 50.0       | 0.0015                  | 2             | 0          |                         | 2             | 100.0      | 0.0056                  |
| 8061995 Mustang Ck at Fm 2757 Nr Crandall, TX      | 16.2                  | 2             | 0          |                         | 2             | 0          |                         | 2             | 0          |                         | 2             | 50.0       | 0.0027                  |
| 8062020 Buffalo Ck Nr Fm 148 Nr Crandall, TX       | 22.5                  | 2             | 100.0      | 0.00985                 | 2             | 100.0      | 0.00305                 | 2             | 50.0       | 0.0037                  | 2             | 100.0      | 0.00265                 |
| 8062090 Red Oak Ck Nr Hampton Rd Nr Red Oak, TX    | 20.8                  | 2             | 50.0       | 0.0044                  | 2             | 0          |                         | 2             | 0          |                         | 2             | 100.0      | 0.0033                  |
| 8062525 Walker Ck Nr Oil Field Rd Nr Rosser, TX    | 62.4                  | 2             | 0          |                         | 2             | 0          |                         | 2             | 0          |                         | 2             | 0          |                         |
| 8062600 Grays Ck at Cr 1603 Nr Rice, TX            | 25                    | 2             | 0          |                         | 2             | 0          |                         | 2             | 0          |                         | 2             | 0          |                         |
| 8062805 Williams Ck Nr Fm 1836 Nr Kemp, TX         | 26.9                  | 1             | 0          |                         | 1             | 0          |                         | 1             | 0          |                         | 1             | 0          |                         |
| 8063047 Bynum Ck Nr Fm 308 Nr Malone, TX           | 20.4                  | 2             | 0          |                         | 2             | 0          |                         | 2             | 0          |                         | 2             | 0          |                         |
| 8063300 Pin Oak Ck Nr Fm 73 Nr Coolidge, TX        | 39                    | 3             | 0          |                         | 3             | 0          |                         | 3             | 0          |                         | 3             | 0          |                         |
| 8063555 S Fk Chambers Ck Nr CR 102 Nr Maypearl, TX | 50.1                  | 6             | 0          |                         | 6             | 0          |                         | 6             | 0          |                         | 6             | 0          |                         |
| 8063565 Mill Ck at Lowell Rd Nr Milford, TX        | 32.2                  | 6             | 0          |                         | 6             | 0          |                         | 6             | 0          |                         | 6             | 0          |                         |
| 8063574 Big Onion Ck at Feaster Rd Nr Bardwell, TX | 20.7                  | 1             | 0          |                         | 1             | 0          |                         | 1             | 0          |                         | 1             | 0          |                         |
| 8063595 S Prong Ck at Fm 876 Nr Waxahachie, TX     | 21.6                  | 6             | 0          |                         | 6             | 0          |                         | 6             | 0          |                         | 6             | 0          |                         |
| 8063692 Mustang Ck at Moseley Rd Nr Ennis, TX      | 21.7                  | 2             | 0          |                         | 2             | 0          |                         | 2             | 0          |                         | 2             | 50.0       | 0.001                   |
| 8064100 Chambers Ck Nr Rice, TX                    | 807                   | 31            | 3.2        | 0.006                   | 31            | 0          |                         | 31            | 0          |                         | 31            | 6.5        | 0.00345                 |
| 8064695 Tehuacana Ck at Rural Rd 27 Nr Wortham, TX | 65.5                  | 5             | 0          |                         | 5             | 0          |                         | 5             | 0          |                         | 5             | 0          |                         |
| 8116650 Brazos Rv Nr Rosharon, TX                  | 45339                 | 80            | 26.3       | 0.006185                | 80            | 20.0       | 0.004427                | 80            | 18.8       | 1.35008                 | 80            | 62.5       | 0.004648                |
| 8178800 Salado Ck at Loop 13, San Antonio, TX      | 189                   | 86            | 43.0       | 0.009316                | 86            | 52.3       | 0.005344                | 86            | 34.9       | 0.00581                 | 86            | 70.9       | 0.004669                |
| 8181800 San Antonio Rv Nr                          | 1743                  | 17            | 5.9        | 0.0161                  | 17            | 0          |                         | 17            | 5.9        | 0.007                   | 17            | 17.6       | 0.0037                  |

| State/Sampling Station                                       | Water-shed Area (Mi²) | Fipronil      |             |                         | Sulfide       |             |                         | Sulfone       |             |                         | Desulfinyl    |             |                         |
|--|-----------------------|---------------|-------------|-------------------------|---------------|-------------|-------------------------|---------------|-------------|-------------------------|---------------|-------------|-------------------------|
|  |                       | Total Samples | % Detected  | Average Detected (ug/L) | Total Samples | % Detected  | Average Detected (ug/L) | Total Samples | % Detected  | Average Detected (ug/L) | Total Samples | % Detected  | Average Detected (ug/L) |
| Elmendorf, TX  |                       |               |             |                         |               |             |                         |               |             |                         |               |             |                         |
| 8364000 Rio Grande at El Paso, TX                            | 32210                 | 117           | 6.0         | 0.002711                | 117           | 0.9         | 0.0066                  | 117           | 0.9         | 0.0078                  | 117           | 12.8        | 0.004807                |
| 8475000 Rio Grande Nr Brownsville, TX                        | 176333                | 110           | 4.5         | 0.002158                | 110           | 0           |                         | 110           | 0           |                         | 110           | 3.6         | 0.005375                |
| <b>Utah</b>  |                       | <b>192</b>    | <b>13.5</b> |                         | <b>192</b>    | <b>0.5</b>  |                         | <b>192</b>    | <b>3.1</b>  |                         | <b>192</b>    | <b>5.2</b>  |                         |
| 10168000 Little Cottonwood Creek @ Jordan River Nr SLC       | 46                    | 109           | 7.3         | 0.003644                | 109           | 0.9         | 0.0061                  | 109           | 3.7         | 2.2666                  | 109           | 5.5         | 0.00545                 |
| 10171000 Jordan River @ 1700 South @ Salt Lake City, UT      | 3438                  | 61            | 29.5        | 0.002497                | 61            | 0           |                         | 61            | 3.3         | 2.42425                 | 61            | 6.6         | 0.003057                |
| 10172200 Red Butte Creek at Fort Douglas, near SLC, UT       | 7.25                  | 6             | 0           |                         | 6             | 0           |                         | 6             | 0           |                         | 6             | 0           |                         |
| 4.02054e+14 (D- 5- 3)27Dcc Provo River at Olmstead Diversion | 644                   | 16            | 0           |                         | 16            | 0           |                         | 16            | 0           |                         | 16            | 0           |                         |
| <b>Virginia</b>  |                       | <b>306</b>    | <b>47.1</b> |                         | <b>306</b>    | <b>33.3</b> |                         | <b>306</b>    | <b>25.5</b> |                         | <b>306</b>    | <b>54.9</b> |                         |
| 1621050 Muddy Creek at Mount Clinton, VA                     | 14.2                  | 60            | 1.7         | 0.0316                  | 60            | 1.7         | 0.0078                  | 60            | 0           |                         | 60            | 1.7         | 0.0086                  |
| 1646580 Potomac River at Chain Bridge, at Washington, DC     | 11570                 | 139           | 34.5        | 0.005308                | 139           | 15.8        | 0.004877                | 139           | 5.0         | 0.005743                | 139           | 60.4        | 0.005135                |
| 1654000 Accotink Creek near Annandale, VA                    | 23.5                  | 107           | 88.8        | 0.023026                | 107           | 73.8        | 0.009165                | 107           | 66.4        | 0.011114                | 107           | 77.6        | 0.007987                |
| <b>Washington</b>  |                       | <b>495</b>    | <b>4.4</b>  |                         | <b>495</b>    | <b>2.0</b>  |                         | <b>494</b>    | <b>0</b>    |                         | <b>495</b>    | <b>6.7</b>  |                         |
| 12069550 Big Beef Creek near Seabeck, WA                     | 13.8                  | 4             | 0           |                         | 4             | 0           |                         | 4             | 0           |                         | 4             | 0           |                         |
| 12070000 Dogfish Creek near Poulsbo, WA                      | 5.1                   | 5             | 0           |                         | 5             | 0           |                         | 5             | 0           |                         | 5             | 0           |                         |
| 12072380 Gorst Creek near Gorst, WA                          | 9.51                  | 5             | 0           |                         | 5             | 0           |                         | 5             | 0           |                         | 5             | 0           |                         |
| 12072660 Olalla Creek at Burley Olalla Road near Olalla, WA  | 3.9                   | 4             | 0           |                         | 4             | 0           |                         | 4             | 0           |                         | 4             | 0           |                         |
| 12073520 Minter Creek near Minter, WA                        | 14.85                 | 5             | 0           |                         | 5             | 0           |                         | 5             | 0           |                         | 5             | 0           |                         |
| 12073895 Coulter Creek near Allyn, WA                        | 14.1                  | 4             | 0           |                         | 4             | 0           |                         | 4             | 0           |                         | 4             | 0           |                         |
| 12080800 Woodland Creek below Draham Road near Lacey, WA     | 17.58                 | 4             | 0           |                         | 4             | 0           |                         | 4             | 0           |                         | 4             | 0           |                         |
| 12090452 Spanaway Cr at Spanaway Lk Outlet Nr Spanaway, WA   | 17.2                  | 4             | 0           |                         | 4             | 0           |                         | 4             | 0           |                         | 4             | 50.0        | 0.0045                  |
| 12102000 Clarks Creek at                                     | 11.13                 | 4             | 0           |                         | 4             | 0           |                         | 4             | 0           |                         | 4             | 0           |                         |

| State/Sampling Station                                     | Water-shed Area (Mi²) | Fipronil      |            |                         | Sulfide       |            |                         | Sulfone       |            |                         | Desulfinyl    |            |                         |
|--|-----------------------|---------------|------------|-------------------------|---------------|------------|-------------------------|---------------|------------|-------------------------|---------------|------------|-------------------------|
|  |                       | Total Samples | % Detected | Average Detected (ug/L) | Total Samples | % Detected | Average Detected (ug/L) | Total Samples | % Detected | Average Detected (ug/L) | Total Samples | % Detected | Average Detected (ug/L) |
| Puyallup, WA   |                       |               |            |                         |               |            |                         |               |            |                         |               |            |                         |
| 12102212 Swan Creek at Pioneer Way Tacoma, WA              | 3.45                  | 4             | 0          |                         | 4             | 0          |                         | 4             | 0          |                         | 4             | 0          |                         |
| 12112600 Big Soos Creek above Hatchery near Auburn, WA     | 66.7                  | 4             | 0          |                         | 4             | 0          |                         | 4             | 0          |                         | 4             | 0          |                         |
| 12113390 Duwamish River at Golf Course at Tukwila, WA      | 461                   | 18            | 0          |                         | 18            | 0          |                         | 18            | 0          |                         | 18            | 0          |                         |
| 12119600 May Creek at Mouth near Renton, WA                | 12.7                  | 4             | 0          |                         | 4             | 0          |                         | 4             | 0          |                         | 4             | 25.0       | 0.0052                  |
| 12119705 Coal Creek at Bellevue, WA                        | 6.19                  | 5             | 0          |                         | 5             | 0          |                         | 5             | 0          |                         | 5             | 20.0       | 0.0048                  |
| 12120500 Juanita Creek near Kirkland, WA                   | 6.69                  | 5             | 20.0       | 0.008                   | 5             | 40.0       | 0.0059                  | 5             | 0          |                         | 5             | 60.0       | 0.004467                |
| 12121600 Issaquah Creek near Mouth near Issaquah, WA       | 56.6                  | 4             | 0          |                         | 4             | 0          |                         | 4             | 0          |                         | 4             | 0          |                         |
| 12125880 North Creek near Wintermutes Corner, WA           | 13.14                 | 4             | 0          |                         | 4             | 0          |                         | 4             | 0          |                         | 4             | 25.0       | 0.0041                  |
| 12127100 Swamp Creek at Kenmore, WA                        | 23.1                  | 5             | 20.0       | 0.0085                  | 5             | 20.0       | 0.0056                  | 5             | 0          |                         | 5             | 40.0       | 0.0043                  |
| 12128000 Thornton Creek near Seattle, WA                   | 12.1                  | 84            | 21.4       | 0.006394                | 84            | 7.1        | 0.006833                | 84            | 0          |                         | 84            | 25.0       | 0.005433                |
| 12128040 Pipers Creek at Carkeek Park, at Seattle, WA      | 2.5                   | 1             | 0          |                         | 1             | 0          |                         | 1             | 0          |                         | 1             | 0          |                         |
| 12150495 Cherry Creek below Margaret Creek near Duvall, WA | 16.75                 | 4             | 0          |                         | 4             | 0          |                         | 4             | 0          |                         | 4             | 0          |                         |
| 12154000 Stevens Creek at Lake Stevens, WA                 | 15.3                  | 5             | 20.0       | 0.0106                  | 5             | 0          |                         | 5             | 0          |                         | 5             | 40.0       | 0.0052                  |
| 12155050 Dubuque Creek Blw Panther Creek Nr Lk Stevens, WA | 12.32                 | 5             | 0          |                         | 5             | 0          |                         | 5             | 0          |                         | 5             | 0          |                         |
| 12464770 Crab Creek at Rocky Ford Road near Ritzville, WA  | 384                   | 34            | 0          |                         | 34            | 0          |                         | 34            | 0          |                         | 34            | 0          |                         |
| 12504508 Sunnyside Canal Div Ab N Outlook Rd Nr Sunnyside  | -999                  | 12            | 0          |                         | 12            | 0          |                         | 12            | 0          |                         | 12            | 0          |                         |
| 12505450 Granger Drain at Granger, WA                      | -999                  | 79            | 1.3        | 0.0043                  | 79            | 0          |                         | 78            | 0          |                         | 79            | 0          |                         |
| 12510500 Yakima River at Kiona, WA                         | 5615                  | 58            | 0          |                         | 58            | 0          |                         | 58            | 0          |                         | 58            | 0          |                         |
| 13351000 Palouse River at Hooper, WA                       | 2500                  | 25            | 0          |                         | 25            | 0          |                         | 25            | 0          |                         | 25            | 0          |                         |
| 4.54321e+14 Curtin Creek near                              | 11.7                  | 2             | 0          |                         | 2             | 0          |                         | 2             | 0          |                         | 2             | 0          |                         |

| State/Sampling Station   | Water-shed Area (Mi²) | Fipronil      |             |                         | Sulfide       |             |                         | Sulfone       |            |                         | Desulfinyl    |             |                         |
|--|-----------------------|---------------|-------------|-------------------------|---------------|-------------|-------------------------|---------------|------------|-------------------------|---------------|-------------|-------------------------|
|  |                       | Total Samples | % Detected  | Average Detected (ug/L) | Total Samples | % Detected  | Average Detected (ug/L) | Total Samples | % Detected | Average Detected (ug/L) | Total Samples | % Detected  | Average Detected (ug/L) |
| Vancouver, WA  |                       |               |             |                         |               |             |                         |               |            |                         |               |             |                         |
| 4.5451e+14 Whipple Creek near Salmon Creek, WA                         | 8.6                   | 7             | 0           |                         | 7             | 14.3        | 0.002007                | 7             | 0          |                         | 7             | 0           |                         |
| 4.54549e+14 Salmon Creek at 167 <sup>th</sup> , near Battle Ground, WA | 22.7                  | 6             | 0           |                         | 6             | 0           |                         | 6             | 0          |                         | 6             | 0           |                         |
| 4.55122e+14 Rock Creek near Battle Ground, WA                          | 10.1                  | 7             | 0           |                         | 7             | 0           |                         | 7             | 0          |                         | 7             | 0           |                         |
| 4.62023e+14 Dr 2 at Yakima Valley Highway near Granger, WA             | 4.15                  | 65            | 0           |                         | 65            | 0           |                         | 65            | 0          |                         | 65            | 0           |                         |
| 4.62023e+14 GwsW Actsw1-1 at Dr2 Nr Granger, WA                        | -999                  | 9             | 0           |                         | 9             | 0           |                         | 9             | 0          |                         | 9             | 0           |                         |
| <b>West Virginia</b>   |                       | <b>7</b>      | <b>0</b>    |                         | <b>7</b>      | <b>0</b>    |                         | <b>7</b>      | <b>0</b>   |                         | <b>7</b>      | <b>0</b>    |                         |
| 1610400 Waites Run near Wardensville, WV                               | 11.6                  | 7             | 0           |                         | 7             | 0           |                         | 7             | 0          |                         | 7             | 0           |                         |
| <b>Wisconsin</b>   |                       | <b>276</b>    | <b>15.9</b> |                         | <b>276</b>    | <b>13.4</b> |                         | <b>276</b>    | <b>7.6</b> |                         | <b>276</b>    | <b>18.5</b> |                         |
| 4063700 Popple River near Fence, WI                                    | 139                   | 2             | 0           |                         | 2             | 0           |                         | 2             | 0          |                         | 2             | 0           |                         |
| 4072016 Duck Creek at Murphy Corner, WI                                | 35.86                 | 1             | 0           |                         | 1             | 0           |                         | 1             | 0          |                         | 1             | 0           |                         |
| 4072050 Duck Creek at Seminary Road near Oneida, WI                    | 95.5                  | 60            | 40.0        | 0.005708                | 60            | 41.7        | 0.005584                | 60            | 28.3       | 0.005659                | 60            | 35.0        | 0.003871                |
| 4072233 Lancaster Brook at Shawano Avenue at Howard, WI                | 9.86                  | 4             | 0           |                         | 4             | 0           |                         | 4             | 0          |                         | 4             | 0           |                         |
| 4078085 Black Otter Creek near Hortonville, WI                         | 15.9                  | 2             | 50.0        | 0.0068                  | 2             | 0           |                         | 2             | 0          |                         | 2             | 0           |                         |
| 4080791 Tomorrow River @ Hemp Fishery Area Nr Garfield, WI             | 23.69                 | 1             | 0           |                         | 1             | 0           |                         | 1             | 0          |                         | 1             | 0           |                         |
| 4081897 Sawyer Creek at Westhaven Road at Oshkosh, WI                  | 11.82                 | 6             | 0           |                         | 6             | 0           |                         | 6             | 0          |                         | 6             | 0           |                         |
| 4084429 Mud Creek at Spencer Road at Appleton, WI                      | 12.85                 | 6             | 0           |                         | 6             | 0           |                         | 6             | 0          |                         | 6             | 0           |                         |
| 4084468 Garners Creek at Park Street at Kaukauna, WI                   | 8.01                  | 2             | 0           |                         | 2             | 0           |                         | 2             | 0          |                         | 2             | 0           |                         |
| 4085046 Apple Creek at Sniderville, WI                                 | 45.8                  | 2             | 0           |                         | 2             | 50.0        | 0.0053                  | 2             | 50.0       | 0.0052                  | 2             | 50.0        | 0.004                   |
| 4085068 Ashwaubenon Creek near Little Rapids, WI                       | 19.9                  | 1             | 100.0       | 0.0632                  | 1             | 100.0       | 0.0061                  | 1             | 100.0      | 0.0128                  | 1             | 100.0       | 0.0072                  |
| 4085188 Rio Creek at Pheasant Road near Rio Creek, WI                  | 21.55                 | 6             | 0           |                         | 6             | 0           |                         | 6             | 0          |                         | 6             | 0           |                         |
| 4085270 Jambo Creek at Jambo   | 18.85                 | 2             | 0           |                         | 2             | 0           |                         | 2             | 0          |                         | 2             | 0           |                         |

| State/Sampling Station   | Water-shed Area (Mi²) | Fipronil      |            |                         | Sulfide       |            |                         | Sulfone       |            |                         | Desulfinyl    |            |                         |
|--|-----------------------|---------------|------------|-------------------------|---------------|------------|-------------------------|---------------|------------|-------------------------|---------------|------------|-------------------------|
|  |                       | Total Samples | % Detected | Average Detected (ug/L) | Total Samples | % Detected | Average Detected (ug/L) | Total Samples | % Detected | Average Detected (ug/L) | Total Samples | % Detected | Average Detected (ug/L) |
| Creek Road near Mishicot, WI                                       |                       |               |            |                         |               |            |                         |               |            |                         |               |            |                         |
| 4085322 Devils River at Rosencrans Road near Maribel, WI           | 29.52                 | 2             | 0          |                         | 2             | 0          |                         | 2             | 0          |                         | 2             | 0          |                         |
| 4085455 Meeme River at Washington Road near Cleveland, WI          | 19                    | 2             | 0          |                         | 2             | 0          |                         | 2             | 0          |                         | 2             | 0          |                         |
| 4086699 Pigeon Creek at Williamsburg Dr at Theinsville, WI         | 11.53                 | 2             | 0          |                         | 2             | 0          |                         | 2             | 0          |                         | 2             | 0          |                         |
| 4087000 Milwaukee River at Milwaukee, WI                           | 696                   | 26            | 3.8        | 0.0123                  | 26            | 0          |                         | 26            | 0          |                         | 26            | 0          |                         |
| 4087030 Menomonee River at Menomonee Falls, WI                     | 34.7                  | 5             | 0          |                         | 5             | 0          |                         | 5             | 0          |                         | 5             | 0          |                         |
| 4087070 Little Menomonee River at Milwaukee, WI                    | 19.7                  | 1             | 0          |                         | 1             | 0          |                         | 1             | 0          |                         | 1             | 0          |                         |
| 4087118 Honey Creek near Portland Avenue at Wauwatosa, WI          | 10.71                 | 5             | 0          |                         | 5             | 0          |                         | 5             | 0          |                         | 5             | 20.0       | 0.0061                  |
| 4087119 Honey Creek at Wauwatosa, WI                               | 10.3                  | 6             | 0          |                         | 6             | 0          |                         | 6             | 0          |                         | 6             | 0          |                         |
| 4087204 Oak Creek at South Milwaukee, WI                           | 25                    | 5             | 0          |                         | 5             | 0          |                         | 5             | 0          |                         | 5             | 20.0       | 0.0059                  |
| 4087213 Root River at Layton Avenue at Greenfield, WI              | 11.87                 | 2             | 50.0       | 0.0018                  | 2             | 0          |                         | 2             | 0          |                         | 2             | 0          |                         |
| 4087220 Root River near Franklin, WI                               | 49.2                  | 1             | 0          |                         | 1             | 0          |                         | 1             | 0          |                         | 1             | 0          |                         |
| 4087258 Pike River at C <sup>th</sup> A near Kenosha, WI           | 38.72                 | 6             | 0          |                         | 6             | 0          |                         | 6             | 0          |                         | 6             | 0          |                         |
| 4087270 Pike Creek at 43 <sup>rd</sup> Street at Kenosha, WI       | 6.29                  | 2             | 0          |                         | 2             | 0          |                         | 2             | 0          |                         | 2             | 0          |                         |
| 5527729 Kilbourn Ditch at 60 <sup>th</sup> Street near Kenosha, WI | 20.74                 | 2             | 0          |                         | 2             | 0          |                         | 2             | 0          |                         | 2             | 0          |                         |
| 5543796 Poplar Creek near Waukesha, WI                             | 23.6                  | 1             | 0          |                         | 1             | 0          |                         | 1             | 0          |                         | 1             | 0          |                         |
| 40850683 Ashwaubenon Creek at South Bridge Rd Nr Depere, WI        | 20.01                 | 1             | 0          |                         | 1             | 0          |                         | 1             | 0          |                         | 1             | 0          |                         |
| 40851235 Bower Creek Trib at Lime Kiln Road Nr Bellevue, WI        | 13.28                 | 2             | 0          |                         | 2             | 0          |                         | 2             | 0          |                         | 2             | 0          |                         |
| 40851325 Baird Creek at Superior Road at Green Bay, WI             | 20.78                 | 6             | 33.3       | 0.00605                 | 6             | 0          |                         | 6             | 0          |                         | 6             | 0          |                         |
| 40851932 Kewaunee River Trib @                                     | 14.18                 | 2             | 0          |                         | 2             | 0          |                         | 2             | 0          |                         | 2             | 0          |                         |

| State/Sampling Station   | Water-shed Area (Mi²) | Fipronil      |             |                         | Sulfide       |             |                         | Sulfone       |             |                         | Desulfinyl    |             |                         |
|--|-----------------------|---------------|-------------|-------------------------|---------------|-------------|-------------------------|---------------|-------------|-------------------------|---------------|-------------|-------------------------|
|  |                       | Total Samples | % Detected  | Average Detected (ug/L) | Total Samples | % Detected  | Average Detected (ug/L) | Total Samples | % Detected  | Average Detected (ug/L) | Total Samples | % Detected  | Average Detected (ug/L) |
| Lowell Road Nr Luxemburg, WI                                       |                       |               |             |                         |               |             |                         |               |             |                         |               |             |                         |
| 40853145 Black Creek at Curran Road near Denmark, WI               | 21.67                 | 6             | 0           |                         | 6             | 0           |                         | 6             | 0           |                         | 6             | 0           |                         |
| 40854395 Point Creek at Ucker Point Road near Newton, WI           | 17.73                 | 2             | 50.0        | 0.0094                  | 2             | 0           |                         | 2             | 0           |                         | 2             | 0           |                         |
| 40869415 Lincoln Creek at 47 <sup>th</sup> Street at Milwaukee, WI | 13.06                 | 80            | 15.0        | 0.00505                 | 80            | 12.5        | 0.00526                 | 80            | 1.3         | 0.0051                  | 80            | 30.0        | 0.004513                |
| 40869416 Lincoln Creek @ Sherman Boulevard at Milwaukee, WI        | 13.48                 | 6             | 16.7        | 0.0052                  | 6             | 0           |                         | 6             | 16.7        | 5                       | 6             | 16.7        | 0.0043                  |
| 40870856 Underwood Cr at Watertown Plank Rd @ Elm Grove, WI        | 9.48                  | 2             | 0           |                         | 2             | 0           |                         | 2             | 0           |                         | 2             | 0           |                         |
| 40872393 Hoods Creek at Brook Road near Franksville, WI            | 15.03                 | 2             | 0           |                         | 2             | 0           |                         | 2             | 0           |                         | 2             | 50.0        | 0.0063                  |
| 55437901 Fox River at River Road near Sussex, WI                   | 23.47                 | 2             | 0           |                         | 2             | 0           |                         | 2             | 0           |                         | 2             | 0           |                         |
| 408703164 Lily Creek at Good Hope Road Nr Menomonee Falls, WI      | 4.33                  | 2             | 0           |                         | 2             | 0           |                         | 2             | 0           |                         | 2             | 0           |                         |
| <b>Wyoming</b>   |                       | <b>32</b>     | <b>0</b>    |                         | <b>32</b>     | <b>0</b>    |                         | <b>32</b>     | <b>0</b>    |                         | <b>32</b>     | <b>0</b>    |                         |
| 6279500 Bighorn River at Kane, WY                                  | 15762                 | 17            | 0           |                         | 17            | 0           |                         | 17            | 0           |                         | 17            | 0           |                         |
| 6324970 Little Powder River Ab Dry Cr Nr Weston WY                 | 1235                  | 3             | 0           |                         | 3             | 0           |                         | 3             | 0           |                         | 3             | 0           |                         |
| 13010065 Snake River Ab Jackson Lake at Flagg Ranch WY             | 486                   | 4             | 0           |                         | 4             | 0           |                         | 4             | 0           |                         | 4             | 0           |                         |
| 4.10714e+14 Crow Cr Abv Morrie Ave, at Cheyenne, WY                | 290                   | 2             | 0           |                         | 2             | 0           |                         | 2             | 0           |                         | 2             | 0           |                         |
| 4.13659e+14 Bear Cr Abv Little Bear Cr, Nr Phillips, WY            | 177                   | 6             | 0           |                         | 6             | 0           |                         | 6             | 0           |                         | 6             | 0           |                         |
| <b>Grand Total</b>   |                       | <b>14448</b>  | <b>27.7</b> |                         | <b>14428</b>  | <b>19.8</b> |                         | <b>14447</b>  | <b>14.7</b> |                         | <b>14428</b>  | <b>28.5</b> |                         |